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CHASING SCREW THREADS.

The operation here illustrated is that of chasing, or, in other words, cutting threads or screws, in the lathe, by hand, which is the most delicate operation performed in a hand lathe, and requires skill of the very nicest kind. In the early days of steam engineering, when screw-cutting lathes were unknown, good hands at chasing were eagerly sought. At that time, many large engineering firms in England used threads of a particular depth and angle, unlike those used by others, to the end that the machinery manufactured by each firm could not be sent elsewhere for repairs Among these private threads, the "Maudsley" and the "Sharp" threads attained most prominence. They were deeper than those now in use, and have been superseded by the Whitworth or standard thread of to-day.

Thomas Maudsley, the founder of the celebrated engineering firm now known as Maudsley, Sons, and Field, had, as far back as 1830, a remarkably efficient screw room, as it was then termed, conducted under the supervision of Mr. Sheriff, who was probably the most expert chasing hand of his time. In Maudsley's private model room, screw cutting by hand was then carried to a high degree of perfection. Among the eminent men who served their apprenticeship in this room were Sir Joseph Whitworth, James Nasmyth, and George and John Rennie. Among its productions was a model of the (at that time) monster (160 horse) marine engine built for the English man of war Dee. This model, which was displayed at the London Exhibition of 1851, had many hand-cut threads in it with a pitch of 100 to the inch, their fit being so perfect as to enable them to sustain very severe strains. The teeth of such a chaser are so fine that, to the ordinary machinist's eye, it would be taken for a scraper, nor would the error be perceived until the tool was applied to the work.

CUTTING SCREW THREADS WITH A HAND CHASER.

The first operation in chasing an outside or male thread is to start the thread, that is, to cut on the work a shallow spiral groove; this is accomplished by running the lathe at a fast speed, and passing the point of a graver or V tool, under a moderate pressure, along the end of the work, the heel of the tool being pressed firmly against the rest, which should be placed as close to the work as possible. This part of the operation requires a great deal of practice, to enable the operator to strike the thread at the correct pitch and true at the first attempt. Beginners will find it an excellent plan to leave about three eighths of an inch in length, of the end of the work to be chased, a sixteenth of an inch larger in diameter than the required finished size, so that, if the first few attempts to strike the correct pitch fail, the marks may be turned out without reducing the work below the required diameter. When a correct pitch is struck, the chaser may be applied, as shown in our engraving, and, while pressed lightly against the work, moved along the rest as nearly at the proper speed as can be judged, and the teeth will find the groove and travel along it. The chaser should be held so that its hind teeth press the hardest against the work, which will keep them in the starting groove, and act as a guide, while the front teeth extend the groove, carrying the thread forward to the requisite length. It is highly important to keep the rest free from the burrs made by the heel of the graver or other tool; otherwise the edge of the chaser will strike against them, and, being retarded in its course, will cause the thread to become "drunken." The leading bottom edge of the chaser should also be rounded off to enable it to glide over such obstructions on the face of the rest. If the metal upon which a thread is to be chased have seams in it, the starting groove should be cut as deep as possible, so as to keep the thread true. The front tooth should come even with the edge of the chaser, so that it will be a full tooth, and the tops of the teeth should stand at an acute rather than at a right angle to the left hand side of the (right hand) chaser, to the end that, when its teeth are parallel with the length of the work, the body of the chaser will lean to the right, and therefore stand well clear of the lathe dog or driver.

The following rules apply to outside or male chasers: For wrought iron or steel, the teeth should be hollow in their length, and should have top rake. For cast iron, the top face of the teeth should be level, or they will cut too freely and rip the threads. For brass, the teeth should be ground at an angle of which the points of the teeth are the lowest. The cutting edge of the chaser should be above the horizontal center of the work; and the body of the chaser should be held as nearly horizontal as will permit the teeth to cut, otherwise the positive or negative rake of the teeth will cause them to cut a thread deeper than themselves.

At the termination of the thread, it is necessary to cut a recess as deep as the thread, in order to give the chaser clearance, and prevent it from ripping into the shoulder, which would form the termination of the thread in the absence of a recess. It is a very common practice to cut this groove or recess with a V tool or graver point, instead of with a round nosed tool, thus producing a recess having a conical instead of a curved outline: the result being to very seriously impair the strength of the bolt, and cause it, under severe strains, to fracture across the section of the bottom of the groove.

In a series of experiments made a few years ago, by the English government, upon targets representing ship's armor, the bolts were found to be unable to withstand the shock caused by the cannon shot striking the target; and it being observed that the fracture nearly always occurred across the section above referred to, the clearance grooves were made with a hollow curve, which obviated the defect. In this connection we may also remark that threads whose tops and bottoms are rounded are much stronger than are those whose angles terminate in a point or angular corner (a fact also demonstrated on the trial above referred to); hence those cut by hand are, in this respect, superior to those cut by the lathe.

Inside or female threads, that is to say, threads cut in the bore of anything, are cut by hand with an inside chaser, which cannot, under any circumstance, have rake upon the top face of the teeth, as the latter necessarily cut at a distance from the lathe rest; and were they made to cut freely, they would rip in, and more power would be required to hold them than can be sustained by the hands of the operator. It is a good plan to bore a small hole in the top of the lathe rest, into which a small pin may be placed to act as a fulcrum, against which the back of the chaser can be pressed to force the teeth into the cut. Inside or female threads are started by pressing the chaser teeth lightly against the bore of the work, and moving it forward at the same time, the thread being started (if a right hand one) at the outer end of the bore, which is rounded slightly off so that the chaser shall not catch. Much experience is required to enable the operator to judge the exact speed of chaser movement required for any particular pitch of thread.

Beginners should always stop the lathe and examine an inside thread as soon as it is struck, for it is an easy matter to cut a double female thread in consequence of moving the chaser too fast, nor will the error be discovered until the thread is finished and the male thread applied, which will not, in that case, enter.

Double threads are those in which the distance from one thread to another is one half only of the actual pitch of the thread. Their nature may be more clearly understood by supposing a thread of five to the inch to be started by a tool in a screw-cutting lathe, and then supposing the tool point to be moved laterally so as to cut another groove, to the same depth, in the center of the spaces between the thread first cut. If a chaser having ten teeth to the inch be then employed to finish the thread, we shall have a double thread possessing all the elements of distance from one thread to another, depth, angle, and strength of a thread of ten to the inch, although the pitch will actually be that of five to the inch.

Double male threads, to be cut by hand, can be most easily started by the chaser, moving it twice as fast as would be required for a single thread, rounding off the corner of the bolt end and taking care to cut principally with the hindermost teeth.

Taps and all other work requiring great accuracy in the depth and angle of the thread should be finished by a chaser, the work (if of wrought iron or steel) being freely supplied with oil until the finishing cuts are taken, when soapy water should be substituted, which will cause the chaser to cut clean and smooth, and give neatness and finish to the threads of the tap.

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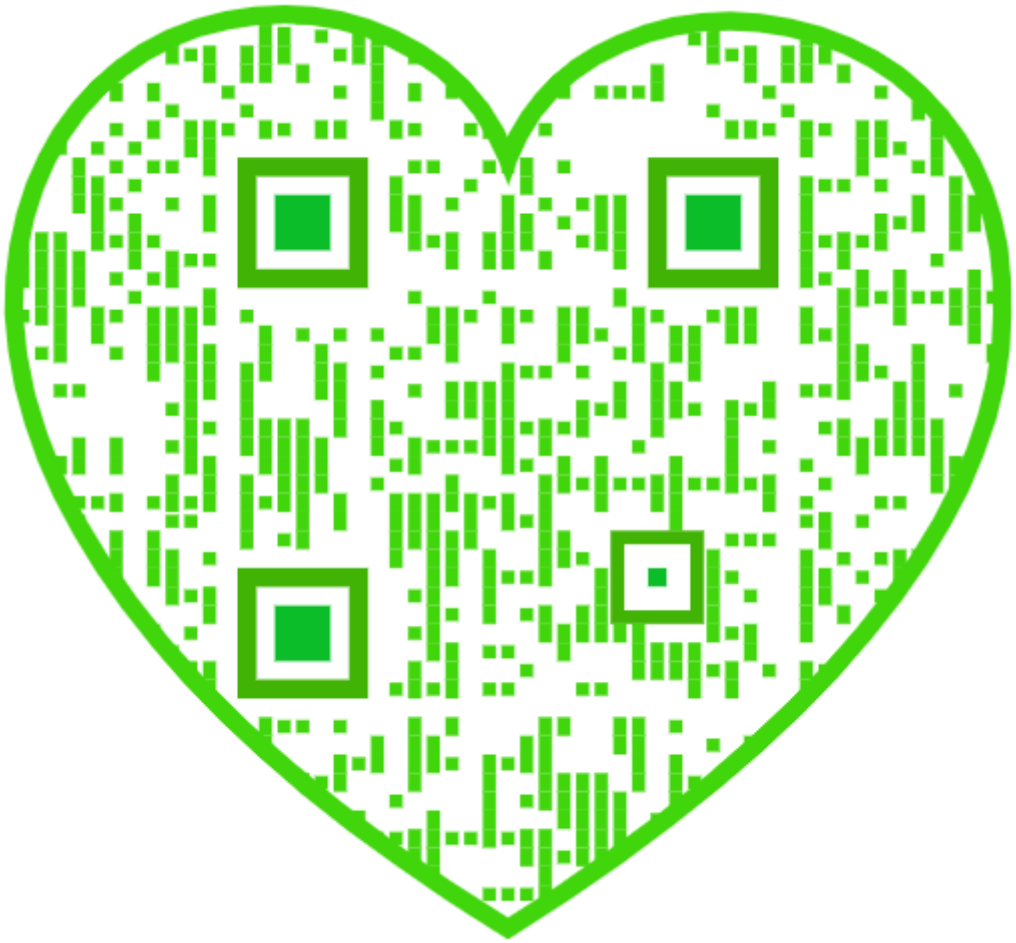

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REPORT OF THE COMMISSIONER OF PATENTS.

The annual report for the year 1874, which has recently been published, presents a very satisfactory statement of the transactions of the Office during that time, and of its present condition. There have been 13,599 patents issued, which exceeds the number for any other year except that of 1869. There have been some extraordinary expenditures, but the revenues have been sufficient to meet all these, leaving a balance of $58,989.76.

The *Official Gazette*, which among other things has superseded the annual Patent Office reports, has the advantage over its predecessor of furnishing from week to week a brief description of the patents which have been issued during the week then ended, setting forth at least the titles, claims, and drawings of such patents, instead of delaying till the end of the year, and several months, and sometimes a year or two, longer, before such information used to be communicated to the public. A charge of six dollars a year must, however, be met by those who would avail themselves of this information instead of receiving it gratuitously, as was formerly done through the annual reports.

A very great improvement has recently been introduced by placing the illustrations in each case in immediate proximity with the respective descriptions and claims. This was done in 1853, but for some reason was afterwards discontinued and a different rule substituted. It is much superior in point of convenience.

We are promised a general index of all the patents issued from 1790 to 1873 inclusive. This index is to consist of two sets of three volumes each: the one of these sets containing an alphabetical list of the names of all the patentees, and the other an index of the subject matter of all the patents that have been issued. These will be of great service. The aggregate cost of both sets, being forty dollars, will, however, probably prevent their being widely disseminated except in some of our principal libraries.

The Commissioner suggests the propriety of making the *Official Gazette* to a considerable extent a business paper by rendering it a medium for advertising. If there are no political objections to such a course, we see none other of sufficient importance to prevent its being adopted. The precedent of thus rendering one of the bureaus of the Interior Department not only a publishing house, but also a competitor for advertising patronage, will probably not be long continued without exciting formidable objections to the proposed practice.

In the necessity of a thorough and systematic revision of the patent law, as set forth in the report, we heartily concur, and trust that such a measure will not long escape the attention of Congress. The present law is full of incongruities and imperfections, which loudly call for the hand of thorough reformation. It is in many important respects far more objectionable than the law which it superseded.

But with regard to the Commissioner's idea of providing for an appeal in cases of the allowance of a patent as well as in those of rejections, we see a very grave objection. How would such an arrangement be successfully conducted? The same rule should be made applicable to all cases. Every patent that is allowed by an examiner should be brought before another tribunal for revision. A double examination would thus become necessary in all cases. If the examiners are fit for their positions this is superfluous; and if they are not it would be pernicious. The wrongful granting of a patent is less harmful than the wrongful refusing of one. If it be said that the examiners who review the first decisions should be men of more ability and experience than they who make those decisions, then we say, discontinue the latter and let the better examiners decide in the first instance.

Practically the present arrangement is in substance the same as the Commissioner proposes in all doubtful cases. The first examinations are usually made by the assistant examiners. If there is any doubt as to the patentability of the subject matter of the application, a rejection is usually the result. A second examination is then called for, which brings the matter before the principal examiner. If the Commissioner, will establish the rule that no patent shall be allowed to issue until the matter is presented to the principal examiner for his approval, he will have what he desires, and without any additional complication or expense. No Patent will in that case issue without a review of the decision of the Officer who makes the first examination, whether the patent be allowed or rejected.

The importance of rendering a patent unimpeachable was long since brought to the attention of Congress by a former Commissioner as will be seen by reference to the Patent Office report for the year 1855. Whether any such plan is practicable, without entailing more injury than benefit, is a matter of no little doubt, but one which is well worthy of serious consideration by the law-making power.

As to the wisdom or efficacy of the competitive examination of candidates for appointment or promotion, we have very grave doubts. A man of superficial abilities will generally, on such an examination, far outshine another of far more sterling and useful qualities. A fresh graduate from a college, with no experience and perhaps but little common sense, would often, on such an examination, surpass the most experienced and useful examiner to be found in the Office. Nothing but a thorough trial, or the exercise of a very sound discretion on the part of the appointing power, will lead to a wise conclusion in such cases. We do not think that such a conclusion can generally be reached through a competitive examination.

PROGRESS AND PROSPECTS OF SOLAR CHEMISTRY.

Several important circumstances unite to give unusual interest to the solar eclipse to occur in April next. The progress of solar chemistry has brought investigators face to face with problems of universal reach and significance, for the solution of which the four minutes of obscuration will be more valuable than as many years of laboratory work. A new instrument, the siderostat, destined, it is thought, to effect a great revolution in astronomical observation, will immensely increase the efficiency of spectrum photography; and the conditions under which the eclipse will be visible promise better opportunities for the observation of totality than can be enjoyed again before the close of the current century, or, more precisely, April 16, 1893. In not one of the four total eclipses which occur in the meantime—1878, 1882, 1886, 1887—or in that of 1900, will the duration of totality be so great, or the central line of the eclipse present stations so favorable for observation. A glance at the grander results accomplished during recent eclipses—following chiefly an elaborate review of the work in a late issue of the London *Times*—may help to make clear the grounds on which the expectations of the present are based.

Between the eclipse of 1860—during which photography decided the long vexed question of the origin and place of the strange red prominences seen round the dark body of the moon at the moment that the sun's disk is covered—and the eclipse of 1868, the spectroscope had revealed the approximate composition of the sun's atmosphere, taken as a whole. The great point to be determined in 1868 was not simply the place and shape of the prominences, but their material. The result is well known, namely, that they consisted of glowing gas, or a mixture of such gases, shot to immense hights through the solar atmosphere.

Almost simultaneously with this discovery, it was found that the prominences could be studied spectroscopically independently of eclipses; and observers were not long in finding out that, outside the bright round face of the sun, was an envelope of glowing hydrogen—the chromosphere—into which magnesium and sodium, and, more rarely, iron and other heavy metals, were injected from below, in the form of a vapor. It was further ascertained that the gases and vapors were not all mixed up together, but that the lightest, such as hydrogen, magnesium, and sodium, were generally at top; and that, as the others were shot up from time to time, some more frequently than others, the heavier were, as a rule, located lower down in the solar atmosphere than the other.

During the eclipse of 1869, the results of previous observations were confirmed; the halo of light outside the prominence envelope was photographed, and it was established that an unknown gaseous element extended beyond the hydrogen, hitherto accounted the lightest form of matter. The green line, by which this substance is distinguished, has not as yet been identified with that of any terrestrial element.

Great preparations were made for the observation of the great eclipse, 1870; but the weather was bad, and, though results of considerable value were obtained, nothing strikingly important was decided. Better fortune awaited the observers of the eclipse of 1871. The corona was photographed, under nearly the same instrumental conditions, from three different places, and the similarity of the pictures proved, beyond all doubt, that part of the corona was a solar appendage. Evidence was obtained, making it extremely probable that the light of the outer parts of the true solar corona—the coronal atmosphere, as Janssen proposed to call it—was stronger in the violet and ultra violet parts of the spectrum than elsewhere. And it was further established that, for some distance above the hydrogen envelope, as seen without an eclipse, less bright hydrogen existed. The inference was that the chromosphere—or lower atmosphere of the sun—consisted of brighter hydrogen and other vapors.

Since 1871 the spectroscopic study of the chromosphere has been carried on vigorously under the clear sky of Italy, and the clearer sky of our mountain observatory in the Far West. Through this thin atmosphere, 9,000 feet above the sea, Professor Young has been able to study a much more complicated chromosphere than appears to observers lower down. Among other things, he has found that, along with magnesium, there frequently appears the vapor of the metal calcium, the principal characteristic lines of which can be seen only under the most perfect atmospheric conditions. In the meantime, extensive laboratory researches have been undertaken for the elucidation of the phenomena observed in the chromosphere. It has been proved that, in the case of any one metal present in the sun, the metal behaves exactly the same in the sun's atmosphere as it does when driven into vapor by the passage of the electric current between the carbon poles of an electric lamp, thus making it possible to interpret many appearances in the chromosphere, which would otherwise be inexplicable: as for instance, the almost complete spectra of hydrogen, the metals of the alkalies and alkaline earths, and the metals of the iron class, while such metals as zinc and lead show only a few lines. The metals of the tungsten, antimony, silver, and gold classes show no traces of existence in the sun's atmosphere; nor do the metaloids, such as oxygen, carbon, nitrogen, sulphur, and the like, which make up more than half of the parts of our planet, so far as known. It would appear, however, that the presence of the latter may be inferred. In fact, it has been claimed that we have, in the solar system, exactly such a record as we should expect if this large class of bodies existed in a comparatively cool part of the atmosphere, at a hight above the hotter lower strata. It is also claimed that granting this, it is possible to explain the various classes of stars by supposing that, as a star grows older and colder, the metaloids are enabled to exist lower down in the atmosphere, and thus to change the character of the spectra of stars bright and hot into that associated with those which are dim and possibly colder; until at last the metaloidal rain, so to speak, falling on the metals below, gives the material of a future crust.

Associated with these chemical questions are physical questions of the greatest interest, the solution of which will help to make clear the development of our Universe from nebulæ to suns and worlds. How far the coming eclipse will further the inquiry remains to be seen. It is confidently expected that the result to be accomplished will be the "fruit and crown" of the work begun in 1860, and carried on with so much zeal by all civilized governments since that time.

The course of the central line of this eclipse is mainly a sea track, yet, in its passage from the Nicobar islands, in the Bay of Bengal, to Siam, it crosses several points that will afford good stations for observation. At Kaikul, in the island of Camorta, totality will continue four minutes twenty-seven seconds. On Bentinck Island, the maximum duration of totality will be four minutes seventeen seconds; at Mergui, four minutes six seconds; at Tenasserim, three minutes fifty-seven seconds; near Bangkok, Siam, to which point astronomers have been invited by the King, the total eclipse will last three minutes fifty-four seconds.

AN IMMENSE TELEGRAPHING ESTABLISHMENT.

The Western Union Telegraph Company moved into their new building, at the corner of Broadway and Dey street, in this city, on the first of February. Moving a large business of any kind from one place to another is usually a troublesome affair, but the peculiarities connected with this business rendered the moving a matter of more than ordinary complication. A merchant can send the fixtures and goods to the new store, and only loses the time required for rearranging them. The telegraph company, however, must continue sending messages from one building as long as it is occupied, and on moving to new quarters must find everything ready for carrying on the work. The wires cannot be shifted from the old building to the new, but a new set must be provided, and a considerable number of new instruments must be in position before any of the old ones can be taken down. So we find that the most of the apparatus and arrangements in the new quarters of the company are also new. We made an examination of the building, a few days after its occu

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pation, and found so much to please and interest us that we propose to give a short description of it to our readers.

The messages are received and delivered in the basement, and the operating room is in the seventh story. When a message is delivered to a receiving clerk, he puts it into a pasteboard cylinder, drops the latter into a pipe, the upper part of which is connected with an exhaust blower, and the message is sent to the operating room without much loss of time. When an operator in the room above receives a dispatch from abroad, he writes it out and delivers it to a clerk to copy. It is then put into an envelope and addressed, and dropped through a tube to the basement, where it is given to a boy for delivery to the person for whom it is intended. These arrangements seem to work very satisfactorily, and interested us exceedingly. The operating room, however, excited our greatest admiration, and it seems to have been designed to please the eye as well as for the efficient performance of the work. Nearly 400 wires are brought into this room and connected with the instruments, which are generally operated by sound; though there are a few printing instruments, in addition to those of the Gold and Stock Telegraph Company. The batteries are on the sixth story, occupying the greater part of this floor, and give the visitor, who knows the effects that can be produced with even a few cells, a very vivid idea of the company's business. Any one who gets up to this hight in the building should continue his ascent until he stands on the roof surmounting the clock tower, for the sake of the magnificent view. Standing in this position, the beholder seems to be almost on a level with the spire of Trinity church, and the city and its environs present somewhat the appearance of an enormous map.

On retracing his steps, the visitor will do well to take a trip in the water balance elevator, and notice how smoothly and quickly it works. The principle by which the car is moved is exceedingly simple. It is balanced over a large pulley by an iron bucket which is connected to it by a rope. If water be admitted in the bucket, it descends and raises the elevator car; if the water is let out, the car descends, and can be held at any point of its path, by the application of a friction clutch. In this brief sketch, we have merely glanced at the prominent features peculiar to the building, which, in design and construction, will bear comparison with the many other elegant structures in New York, and is an ornament to that part of the city in which it is located.

A NEW STYLE OF BOOK-MAKING NEEDED.

There are few books which have more than a temporary life or a temporary value. Like the daily newspaper, nine books out of every ten, perhaps ninety-nine in the hundred, serve a present purpose, are read and thrown aside. This leaving out of the account the great mass of books which have no purpose and are never read. Even of standard books in science or literature, new editions are constantly superseding the old, and though the work itself be immortal, the individual copies have but a brief existence. Today the the book stores are full of the "latest edition;" tomorrow you will find a copy only in out-of-the-way places, or on the shelves of second-hand dealers. In a short time the fireplace or the paper mill have made an end of all but the struggling copies in unused libraries. Not one copy in a million is worn out by use, yet most books are printed and bound as though they were to be used for ever.

The direct consequence is that a man who has to read, say a hundred books a year—and he will have to do something like that to keep up with the drift of thought in its various departments—such a man will have to pay for a hundred bindings which he does not want, a hundred packets of thick paper which he has no use for, and an uncertain but certainly large bill of charges for carriage, handling, and the like, which might for the most part be avoided. A secondary consequence is that few men can afford to buy many books, and those who do buy have to stand the excessive cost of small editions.

It is no doubt more satisfactory to the booksellers to handle a few books at a large price than a multitude of cheap ones, the profit being the same, and naturally they favor that method of publishing. Nevertheless we believe that the successful book maker of the future will print for the million as well as for the few, and be the gainer by it. We believe, too, that any responsible firm which should enter at once upon the work of printing good books, especially scientific books, so that they could be sold for a quarter the price now asked for books of the kind, would achieve a splendid success. But they would have to print editions of a hundred thousand.

The book publisher prints an edition of a thousand copies, say of Helmholtz's "Essays," charges two dollars or two and a half a copy, and loses money. The magazine publisher puts into a pamphlet a greater amount of matter at an immensely greater cost, taking illustrations and all into account, prints fifty or seventy-five thousand copies, and makes a profit, selling them at one tenth the price of the book. Printed on thin yet clean white paper, on type the size of that of this page, the book could be sold in like quantity, unbound, for the price of the magazine, and at a greater profit, the first cost being so much less.

We have taken an extreme case, a book not calculated to be very popular, believing that the market for even such books might be indefinitely increased were they offered cheap enough. A work like Draper's "Conflict of Religion and Science" would outsell any magazine at the same price.

Of course an enterprise of this sort would have to be conducted with great discretion—as every new venture must—and possibly with a preliminary outlay like that involved in starting a successful magazine. The first issue might not pay at once, nor the second, nor the third. It would take time to convince the public of the real existence of the enterprise, and to prove itself worthy of confidence; this done, its success would be morally certain.

The comparative failure of several excellent series of nominally cheap scientific publications is no ground for doubting the success of a more liberal scheme such as we have suggested. The little pamphlets in question have really been very dear. Containing not a tenth as much matter as a Harper's or Scribner's *Magazine*—chiefly reprint matter at that—their price has been twenty-five cents. Printed on heavy toned paper and prettily covered, they were undoubtedly worth twenty-five cents as things go: but the mass of readers have no money to spare for such luxuries. At ten cents a copy, the pamphlets would find thousands of buyers where they now find a hundred.

Said a prominent publisher to the writer not long ago: "The book business has seen its best days. Men do not read books any longer, they read the papers and magazines." In view of this change of habit in the reading world, the proper thing for the book makers to do is to change their habits accordingly. To a limited extent, high-priced, handsomely bound books will always be called for, but not by the multitude. To reach the masses, the book makers will have to meet the publishers of periodicals on their own grounds, and give an equal amount of matter for the same price, and give it when it is wanted.

To the objection that newspapers and magazines have their advertising pages to help them, it need only be said that a book in pamphlet form will carry advertisements just as well as a magazine; and with as large a circulation assured, the advertising pages would be just as valuable.

WHAT ARE BACTERIA?

Truly a question of Life and Death! In their microscopic field of existence, the great battle of biology, the problem of life's beginning, must be decided. So, too, one of the greatest problems of pathogenesis hinges on their origin and effects. Are they or are they not the cause of endemic and so-called "specific" contagious diseases?—a class of diseases which have been aptly described as distinguishing one country from another, one year from another; which have formed epochs in history, and, as Niebuhr has shown, have influenced not only the fall of cities such as Athens and Florence, but of empires; which decimate armies and disable fleets; take the lives of criminals which justice has not condemned; redouble the dangers of crowded hospitals; infest the habitations of the poor, and strike the artizan in his strength down from comfort to helpless poverty; carry away the infant from the mother's breast, the old man at the end of life, and fall with excessive fatality on strong men in their prime and vigor.

What are bacteria?

Four answers have been given to this question. Ehrenberg's, that they are animal organisms of the lowest grade having an individuality of their own; Hallier's, that they are of the nature of spores, produced from and destined to develope into some of the simpler microscopic fungi: Cohn's, that they represent the free-swiming stage in the existence of certain algæ; Bastian's, that they are the first and most common developmental phase of newly evolved living matter, capable, either singly or in combination, of developing into many different kinds of living things.

Ehrenberg's view is quite obsolete. They are not animals, nor are all agreed that they are vegetables. For these and other doubtful organisms of the lowest rank, Haeckel has proposed a new kingdom—the *protista*, intermediates between and connecting the animal and vegetable kingdoms, and from the modification of which both animals and plants have been derived. Barring the last clause, the proposition bids fair to be generally adopted, as it relegates to a sort of no-man's land a group of organisms in which animal and vegetable characteristics are so united that they cannot be classed with either animals or vegetables.

All that is positively known of the origin of these organisms is that they speedily make their appearance in all infusions of organic substances exposed to light and air, and under other conditions not so clearly understood. The smallest—usually globular—specks, ranging between a one-hundred-thousandth and a one-twenty-thousandth of an inch in diameter, have been variously denominated monads, microzymes, and plastide particles. According to Bastian, who adopts the last name, they are merely temporary and initial forms of many organizations which may afterward present distinct characteristics of their own; though some of them, through default of necessary conditions, may never actually develope into higher modes of being. From those which do continue their development, he holds, bacteria and other forms, which others have thought specific, are produced by a direct process of growth and development. In size and character, these bacteria and others differ according to the degree of putrescibility of the solution in which they appear, the amount of heat to which it has been exposed, and other modifying conditions. From this point of view, a rigid specific classification is uncalled-for and impossible.

According to Hallier's view, the smallest living specks of living matter—he calls them micrococci—are minute particles of plasma or naked matter produced by the repeated subdivision of the nuclei of fungus spores, or by the breaking-up of the protoplasmic contents of the larger reproductive cells of certain fungi. When introduced into a fluid capable of undergoing alcoholic fermentation, these micrococci, he says, develop into cryptococci, bodies resembling ordinary yeast cells; in an acid fluid, or one which becomes acid through fermentation, the micrococci assume the elongated forms commonly called bacteria, but which he names anthrococci. The first and the last named multiply by fission, while the cryptococci increase by a process of budding. By an elongated growth, the anthrococci are described as developing into distinct fungi of the oïdium type.

Thus, determined by the nature of the fluid in which they grow, micrococci are said to develope either at once into *torulæ* cells from which a perfect fungus may result, or into *bacteria*, which develop into segmented filaments and thence into distinct fungi of a different type The various fungi so developed are supposed by Hallier to be capable of reproducing micrococci, as already described, and so completing the circle of life: an hypothesis which seems to have no other foundation than a desire to escape the necessity of admitting the origin of micrococci *de novo*.

Cohn classifies more extensively. By his latest scheme bacteria are divided into four groups and six genera, as follows:

I.	Sphæro-bacteria	Genus	1 Micrococcus
II.	Micro-bacteria	"	2 Bacterium
III.	Desmo-bacteria.	"	3 Bacillus
		"	4 Vibrio
IV.	Spiro-bacteria	"	5 Spirillum
		"	6 Spirochæta

The first group appears to correspond with the micrococci of Hallier and the plastide particles of Bastian. They are exceedingly minute darkish or colored granules, frequently presenting the appearance of beaded chains. The whole group is divided by Cohn into three sections—the chromogens, the micrococci of pigmentation; the zymogens, those of ferment; and the pathogens, those of contagion. The chromogens have been the means of producing miracles, by causing bread to exude blood under "supernatural" circumstances, as in the instances described by Rivolta. Among the pathogen micrococci are *m. vaccinæ*, observed by Chauveau and Sanderson in vaccine lymph; the *m. diptherieus*, to which diphtheria is attributed, and *m. septicus*, found in the milary eruptions of typhus, pyæmia, and some other diseases. Lebert mentions also small pox, septicæmia, mycosis intestinalis, and puerperal infectious diseases, as characterized by the presence of members of this group.

The true bacteria Cohn divides into two species, *b. termo* and *b. lineolæ*. The first are the "dumb bell" bacteria, so called from their shape. Their length is about one nine-thousandth to one twelve-thousandth of an inch, and they move with a slowly vacillating motion. These Cohn regards as essentially the ferment of putrefaction, and is doubtful whether putrefactive changes can take place without them. *b. lineolæ* are rod-shaped and somewhat larger. They move with a somewhat stronger and more rapid to-and-fro motion. Lebert says they are constantly present in malignant pustule, They are regarded as essentially the ferment of sour milk.

The desmo-bacteria, or linked rods, as their name implies, are divided into two genera—bacillus, with transversely lined filaments, and vibrio, with filaments cylindrical and curved. The first Cohn divides into three species: (1.) *B. subtiles*, a slender, supple thread found in stale boiled milk; length one five-hundredth of an inch. It has a pausing motion, like that of a fish forcing its way through reeds. (2.) *B. anthracis*, an immovable, oblong, highly refractive body found in the blood of animals having carbuncle; length one ten-thousandth to one two-hundredth of an inch. It is occasionally found in chains of two or three links, and is remarkable for being unaffected by water, alcohol, ether, acetic, nitric, or phosphoric acid, soda, potassa, or ammonia. Sulphuric acid readily destroys it. (3.) *B. ulna*, which is distinguished from (1) by the greater thickness of its filaments and by its rigidity; length one six-hundred-and-fiftieth of an inch. It is found in the stale infusion of boiled egg. The vibrios are distinguished from the bacilli by their rotary motion. *V. rugula*, a curved, flexible thread one twenty-five-hundredth to one twelve-hundredth of an inch long, is found in the evacuations of cholera, diarrhœa, etc. Its rotation is slow. *V. serpens* is distinguished by the greater number and regularity of its curves, by the rigidity of its filament, and its more rapid motion; length about one two-thousandth of an inch.

The last group embraces the corkscrew bacteria. The three species of spirilla are distinguished chiefly by their relative size, the great regularity and closeness of their curves, and their uniform corkscrew motion. Lebert associates spiral bacteria with relapsing fever.

Whether bacteria are really responsible for the various maladies attributed to them is a question which involves too many considerations to be discussed in this connection.

The Diamond Drill in Dentistry.

At a recent meeting of the First Judicial District Dental Society, W. G. A. Bonwill recommended the diamond drill for the permanent separation of the incisors. The shape is pyramidal. It makes about five thousand revolutions per minute, and, in consequence of its extreme rapidity, causes not the least pain, even when cutting upon the most delicate enamel. Working so rapidly and perfectly, it will cut through or over the surface of the poorest fillings, without disturbing them in the least.

What Two Dollars Did.

W. J. Sanderson, of Syracuse, says that a two-line advertisement, which he put in the SCIENTIFIC AMERICAN a few weeks ago, brought him replies from all parts of the country, repaying him a hundredfold.

THE imperfections of the diamond, and in fact of all gems, are made visible by putting them into oil of cassia, when the slightest flaw will be seen.

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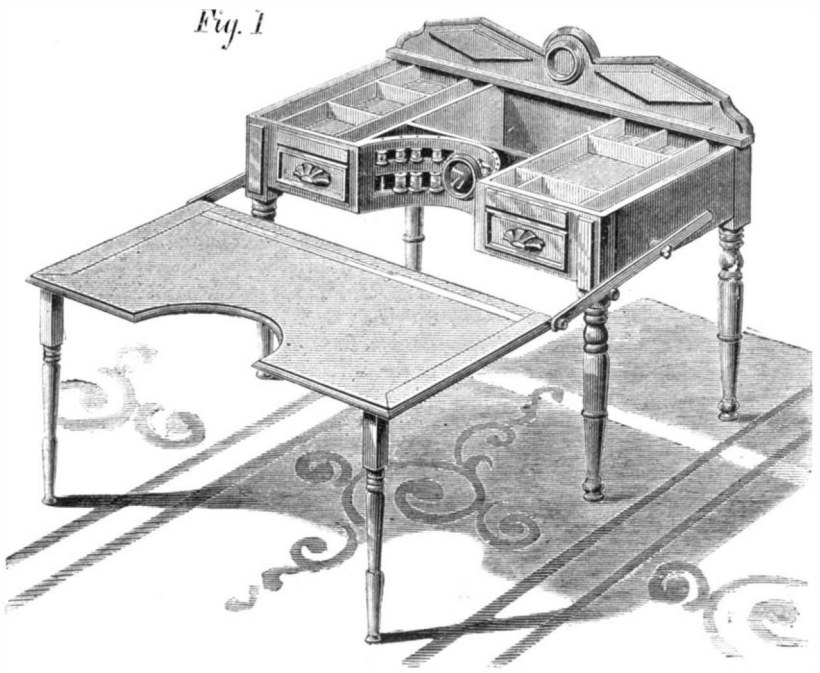
IMPROVED LADY'S WORK TABLE.

The accompanying illustrations represent a new lady's work table, patented to Mr. C. R. Snyder, December 1, 1874. The lid of the table, as shown in Fig. 1, is readily convertible into a lap board by the side arms turning on a pivot, and resting, when down, on pins in the table legs. The legs of the lap board serve as supports for the table lid when up, and are then folded under, out of sight, as indicated in Fig. 2. If desired, the lap board can be detached from the table and used independently, in which case the elongated side arms become legs. The conformity of the table to the shape of the lap board gives a beautiful design for the former, and at the same time admits of a very convenient arrangement.

The recess in front is used for a double row of spools, retained in place by brass standards. The center piece forms a pincushion. This recess may be tastefully ornamented. The divisions over the right hand drawer may be used for writing utensils, those over the left drawer for "notions," while the division between will hold a large quantity of cut and basted work. These tables are manufactured by the inventor, corner 2d avenue, South, and 14th street, Minneapolis, Minn. He may be addressed for further particulars by parties wishing to manufacture in other States.

Fig. 1



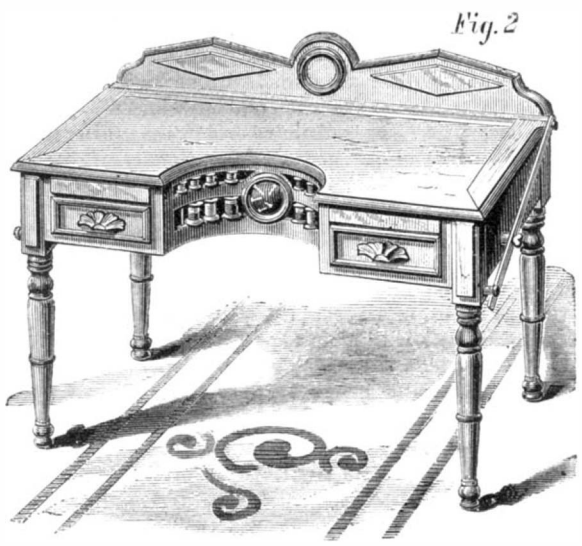
SNYDER'S LADY'S WORK TABLE.

The English Engine Driver.

It is one of the most singular facts connected with modern literature that the deep and striking poetry of the rail and the locomotive has never yet inspired any man of genius to sing it forth to the world. Probably it is a consequence of the classical training of modern youth. Our poets get mad over the achievements of Greeks and Romans, over the Isthmian and other games, and seem absolutely blind to the fact that the things which put them into ecstacies are quite childish compared with the everyday marvels of the age we live in. No doubt "distance lends enchantment to the view;" still the Greek charioteer who, standing on a very rickety two-wheeler, whips his horses along in the Olympian races is at best a prosaic figure when placed in contrast to an engine driver on any of our great lines of railway. The fire horse of our modern steam charioteer is infinitely more majestic than the noblest stallion seen in old Greece, and the speed at which he flies through the air is, compared with the Isthmian games, as the eagle's flight is to the crawling of the snail. In simple truth there is scarcely anything done by human beings that approaches, in daring, in true and absolute heroism, to the hurling of an express train through space at the rate of a mile a minute and more, a speed far superior to the velocity of the hurricane.

The master of the locomotive, though perhaps not willing himself to be a hero of romance, is, for all that, a very real, if quiet and unassuming, hero. There is something most manly, firm, and of the true heroic about all engine drivers, more especially those who have seen many years of service, and are trusted with fast and express passenger trains traveling long distances. Engine drivers of the latter class are seldom under forty years of age; and being picked men, fully conscious of the immense responsibility of their position, and accustomed to look with clear eye and unflinching nerve upon danger and death, daily braving the elements in the simple execution of their duty, they are, as a rule, singularly calm and self-possessed.

Fig. 2



The pay of the highest class driver, a senior in all respects, is from $1.75 to $1.87 per day; $1.87 is the maximum on most of our smaller railways, notably those south of the Thames; but the maximum is considerably surpassed in the pay given to the most trusted engine drivers on the great lines running northward and westward from London, and the trains of which are unsurpassed for speed and excellence. The Great Western Company give the high pay of $2.75 per day, besides a bonus of $50 per annum to a few veterans in the service, drivers of expresses. The $2.75, among others, is the "compensation" of the dauntless, iron-sinewed charioteers who drive the "Flying Dutchman," fastest train in the world, from London to Bristol.

On most of our great lines of railway, the hours of duty of the engine driver, like the hours of work of the guard, vary from day to day. The driver generally follows a time bill under the regulations of which every week day gives him a different train, with additional changes on Sundays, the whole so arranged that he has alternately day and night duties, and has besides about one half of the Sundays in the year for days of rest. Experience, the guiding principle in all railway management, has shown that this system is the best that can be made, and it is certain that, as it works well, so it gives thorough satisfaction to the drivers, more especially to those best able to form a judgment, the veterans of the service.

Considering the extremely fatiguing nature of his duties, his exposure to the rain and wind and all the extremes of heat and cold, and the wear and tear of mental anxiety he has constantly to undergo, and which reaches a climax when snow and fog, his great enemies, obstruct his outlook, the work of the engine driver is truly astounding as to its extent and amount. The average distance traveled over by the drivers of passenger trains on our smaller lines, as representative of which the South Eastern may be taken, is 800 miles a week, or about 40,000 miles a year; but this average is far surpassed by the drivers of the great express trains on the lines north of the Thames. A careful calculation of the distances traveled by the Great Western driver, whose time bill has been analyzed, shows that, in the course of one year, commencing November 4, 1873, and ending November 3, 1874, he hauled his trains, often at express speed, over 65,323 miles of ground, being an average of 1,256 miles per week. It seems terrible work; still the veteran here referred to, upwards of twenty-two years in the service of the Great Western, testifies, with many others, to the fact that the exertions gone through, great as they are, do not only not affect the health of a strong man with good nerves, but fortify his constitution, so as to harden it against age and disease. It is certain that engine drivers, as a class, look extremely florid and healthy, and mostly younger than they really are. No doubt they get abundance of ozone into their lungs; and if they will only stave off the enemy rheumatism by good flannel armor and temperance—the latter universal among the best drivers, not a few of whom are teetotalers—they have as much chance of living to the age of Methuselah as any of the most favored classes of the community, including country parsons. Besides, great as are the physical hardships which the engine driver has to undergo, there is some compensation for it, as for most things, in a corresponding feeling of elation, which no habit can altogether destroy, from flying through space with enormous swiftness. If Dr. Samuel Johnson held it the greatest joy of human life to travel in a post coach with four horses at the rate of twelve miles an hour, the man who rides the Flying Dutchman must surely feel at times, if not always, a joy of superhuman intensity by getting through space five times as fast—at a greater rate of velocity, indeed, than anything that ever moved on the face of the earth, except a cannon ball. There are men of birth and education, who, properly trained, act occasionally as engine drivers—a well known instance of the kind exists on one of our southern lines—and they confess that there is an excitement and a charm, that nothing can excel, in the riding of a fire horse. It may be said of the engine driver, as of no other mortal man: "He hath his way in the whirlwind and in the storm."
—*London Railway News.*

A Large Magnet.

The Sheffield Scientific School, says a contemporary, has just received a very important addition to its physical apparatus, in an immense electromagnet, together with the accessories necessary for the study and illustration of magnetic phenomena. This splendid apparatus has been presented to the school by its ingenious and enterprising manufacturer, William Wallace, of Ansonia, who for many years has made a special study of electricity and magnetism, and for his own use has constructed some of the largest and most efficient pieces of apparatus ever employed in this department of physics. This great magnet, for which the Sheffield school is indebted to Mr. Wallace's deep interest in its work of scientific training, is only second in size, it is believed, to one other in the country, which was also made by Mr. Wallace a few years ago, and was purchased by the Stevens Institute of Technology. The Yale magnet weighs altogether nearly half a tun, and is capable of lifting, it is said, twenty times that weight, or over ten tuns, when in full action. The public, it is presumed, will have an opportunity of seeing it in operation before long, as one of the lectures in the mechanics' course, now going on at the school, is on the subject of magnetism.

Washing Out the Stomach.

Dr. Ewald, of Berlin, Prussia, is said to have been very successful with the process some time since devised by him for washing out the human stomach. "For this purpose, a piece of ordinary india rubber tubing, such as is used for gas lamps, and about six feet long, is employed; one end is rounded, and two holes are punched at a short distance from the end. This tube is found to possess quite sufficient rigidity to be passed without difficulty into the stomach. To the outer end a funnel is fitted, into which is poured either water or a solution of soda, etc., according to circumstances. If the contents of the stomach are to be removed, the outer end of the tube must be sunk to the level of the pubes, or even lower; then the patient must make a short but forcible contraction of the abdominal walls. By this means the tube is filled to its highest point with the fluid contents of the stomach, and becomes a siphon, the liquid continuing to flow until there is no more, or until the tube is stopped up. This latter seldom occurs, if the tube be of moderate caliber."

This is certainly a novel treatment, but one which we would not advise any of our readers to try. We think that the running of an india rubber tube down into the stomach, and pumping water into it, is a ticklish operation.

IMPROVED SAD IRON.

A simple form of detachable handle is illustrated in the annexed engraving, the object of the device being to economize space on the stove or range, and to obviate the use of fixed handles and iron holders, thus offering advantages both in point of economy and of convenience. The standards of the handle are jointed together, and at their widest branching portion receive a rod. One end of the latter is threaded, and passes through a movable nut in the standard, at A. The other extremity passes through a square aperture in the opposite standard, and carries a pivoted cam, B. The wooden handle is supported by the rod between the standards, as shown. Below the joints the standards terminate in two vertical pieces, which are of proper size to fit into holes bored close together near the center of the top of the flat portion of the iron, and slightly inclined from each other from the top downward. When the cam, B, is pushed down, after said pieces are inserted in the holes, it presses the standards toward the handle so as to cause the parts to bind in the holes, thus securing iron and handle firmly together.

Fig. 1

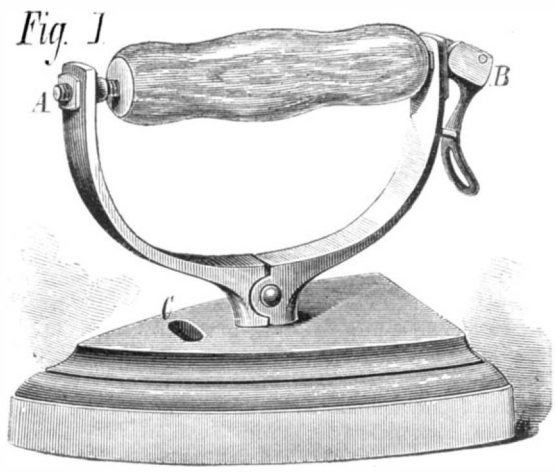
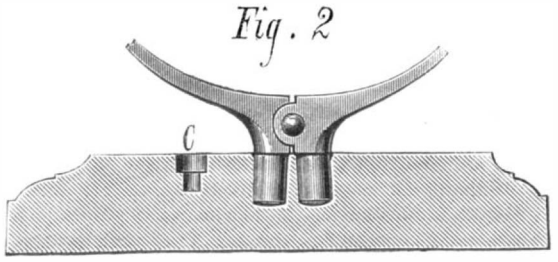


Fig. 2



Raising the cam, of course, releases the portions. A sectional view of the iron, with handle in position, is given in Fig. 2.

In order to adjust the handle it is removed from the iron, and the nut, at A, inserted in the square hole, C. This holds the nut as the handle is turned to regulate the binding pressure of the standards, and to adjust them for holes of varying distances apart.

We are informed that this device obtained the highest premium at the recent Mechanics' Fair in Boston. Patented through the Scientific American Patent Agency, July 14, 1874. For further particulars regarding sale of shop rights to manufacture on royalty, address the inventors, Messrs. Rathbun & Shaw, 209 Union street, Worcester, Mass.

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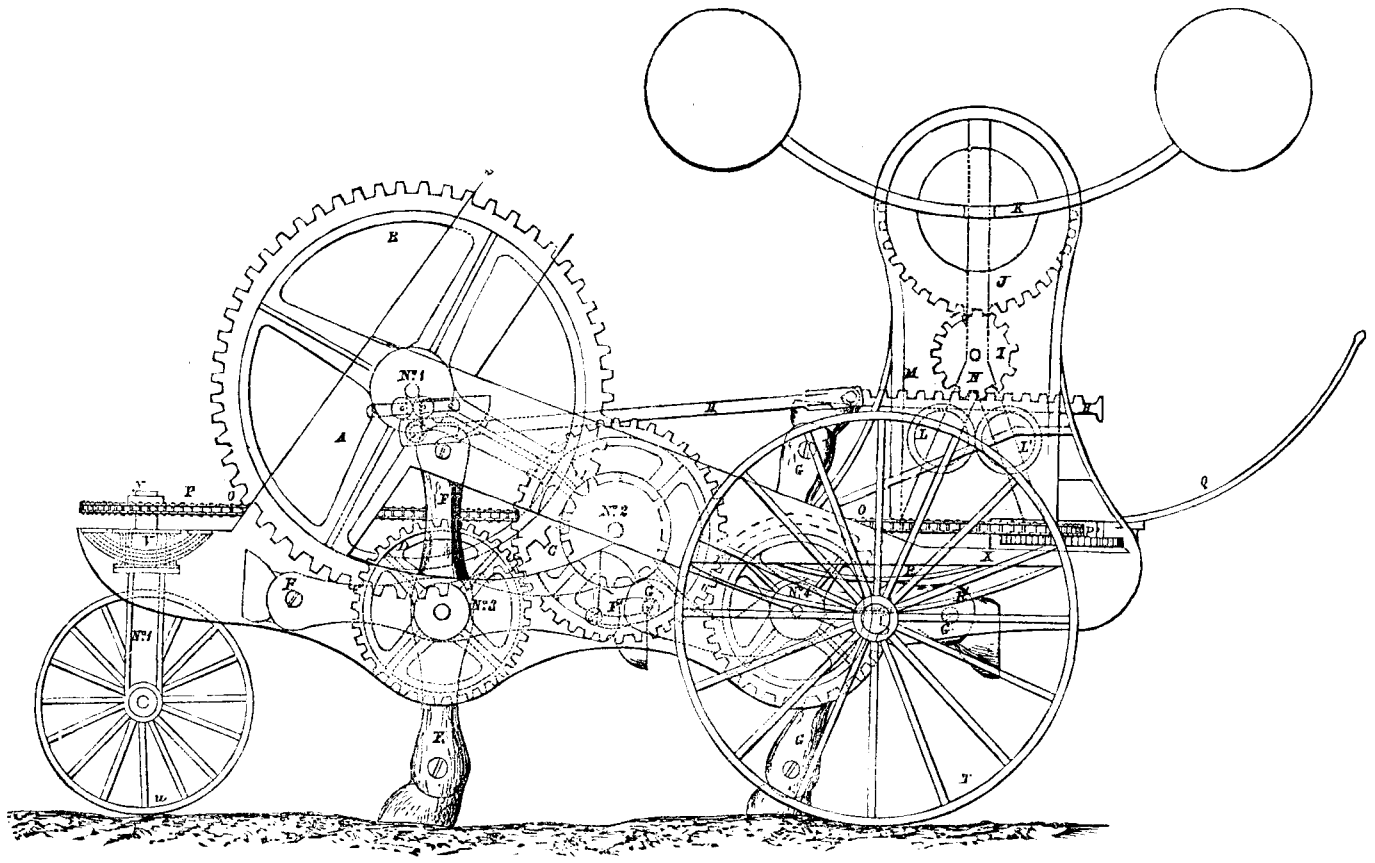
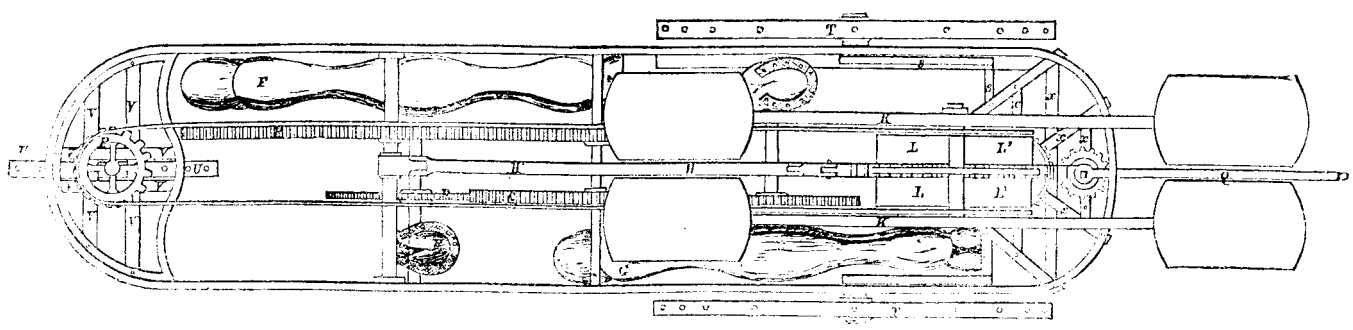
A MACHINE HORSE.

The annexed illustrations are reduced facsimiles of the drawings attached to the specification of a machine horse, recently patented in England, and with reference to which sundry paragraphs have appeared in many of our contemporaries on both sides of the Atlantic, and to which allusion was recently made in these columns. The invention will elicit a greater degree of interest for its oddity than for its practicability; in fact, we fail to perceive how the oscillation of a heavily weighted lever would be sufficient to develop power enough to give the machine the tractile force of a horse. If the inventor means that this oscillation is to be imparted by hand (and we see nothing to the contrary in the specification, nor anything mentioning the use of a superior force), then we fear that he has fallen into the too common error of supposing that machinery can generate power. However, the device is quite a curiosity, and hence we submit the drawings, with the following brief description, to the investigation of our readers.



BRET'S MECHANICAL HORSE.

Fig. 1 is a sectional elevation. Fig. 2 is a plan view from beneath. The shape of the frame, A, is that of an elongated triangle, and the materials are cast iron and wood. K is one of the two balance levers, each loaded at the ends with two iron balls which are filled with either mercury or lead. These levers are pivoted and are attached to the sector, J, which gears with the pinion, I, and this last engages with the rack, H. The rack rests and slides to and fro on fixed pulleys, L, and communicates with the connecting rod, H, giving the same, as the balls oscillate to and fro, a reciprocating motion, and thus, by the medium of a crank, rotating the gear wheel, B. The last meshes with the pinion, G', of the wheel, G, and thus rotates the cog wheels, D and E. These cog wheels are upon axles which are journaled in the frame, and which, on either side of the wheels—these being arranged in the center—carry a pair of legs. Consequently the forward axle, marked No. 3, actuates the fore legs, while the rear axle, No. 4, actuates the hind ones. There are, however, two pair of legs on each axle, each pair being in one, and the axle passing through the center, and the pairs on the same axle being set at right angles to each other. This will be understood by reference to the engraving, in which F F, full lines, show one pair, and F F, dotted lines, the other. Similarly at G G, in the rear axle. The disposition of the legs is such that two feet strike the ground at a time, and these are diagonally opposite each other: for instance, the left fore and right hind foot, and *vice versâ*. Pivoted hoofs are provided at the pedal extremities, which, it is claimed, afford a clinging purchase. Guiding is accomplished by manipulating the lever, Q, which, by suitable interposing gear wheels and chain bands, turns the steering wheel, U. The rear wheel, T, sustains the main portion of the weight of the machine.



BRET'S MECHANICAL HORSE—PLAN VIEW.

M. Charles Bret, captain in the French army, is the inventor, and he thinks that the machine, with the trotting feet uncoupled, might advantageously be used as a driving engine, an idea to which we must decline to agree, at least until some one convinces us of the utter fallacy of all generally accepted mechanical truths.

Railway Reflections.

Has not the railway affected, influenced, altered yea, directed, the drift—the direction, of human thought? We are all influenced by the circumstances that surround us. Who is there that is independent of the material or the social phenomena of his time? The mode, manner, and style of locomotion used by man influence his being, molding his character and affecting his habits of thought and action. The fashion of our motor power controls our feelings, and affects our emotions. To mount the horse is to partake of his nature—to sympathize with his spirit, bound, curvet, or caper, as his sportive mood may suggest. When we are seated in he railway carriage do we not mentally snort in accord with the iron steed—take pride in his speed, and glory in the force with which he devours distance? How different is the feeling of a man who is carried in a palanquin, or towed in a canal boat, from that of one who is whirled along in an express train, with a telegraph caution ticking in front, and a way train whistle screaming in the rear!

The railway has enforced habits of promptitude, illustrated the value of time, and shown the power of discipline. On the disk of our railway dial, no shadow is allowed to linger. Our time tables are as absolute as the laws of the Medes and Persians; the locomotive has employed our legislatures to devise new codes of laws for its government, and engaged our judges in interpreting its rights and privileges. Into every grade of modern society, the interest of the railway has extended.

The multitude of engineers, mechanics, workmen, clerks, and conductors who are kept employed in this service would be difficult to estimate; they constitute a large section of the population, a standing army of industry; and what an enormous supply of iron, timber, coal, oil, and other natural products the railway demands every year! In the manufacture of its necessary supplies, how many new trades have sprung up and are supported!

The property of our railways dominates the money market of the country. The capital of our time has run so largely into railways that every one who owns any surplus may be said to have an interest in railway property. It would be interesting to calculate the proportion of capital invested in railroads, as compared with banking, manufactures, insurance, or even agriculture.

As the overflow of the Nile enriched the plains of Egypt, so has the flood of railways over the land enhanced the value of the soil. The locomotive has virtually irrigated barren wastes, actually tempered the climate of inhospitable regions.

Probably no interest has been so largely promoted by the railway as that of real estate. Every farm has felt its influence. It has brought a market place to the farm of every husbandman; a customer to the workshop of every mechanic. Families are reunited; friendships maintained; intercourse established by the facility of railway travel. We eat, drink, sleep, live on the railway.—*The Railway World*

The Production of Arsenic in Copper Mines.

In 1873, 5,449 tuns of arsenic were produced in England. More than a third of it came from the Devon Great Consols mine. Sometimes 200 tuns a month are sold from this mine, a quantity of white arsenic sufficient to destroy the lives of more than 500,000,000 of human beings. The Commissioners of Mines saw, stored in the warehouses of the mine, ready packed for sale, a quantity of white arsenic probably sufficient to destroy every living animal upon the face of the earth. The Commissioners consider that, in the case of mines in which arsenic is actually manufactured, it is only reasonable that the manufacture of a poison so virulent should be subject to special state supervision; and they submit that an officer should be empowered to require that the best practicable means be taken not only to prevent the poisoning of the air by the volatilization of the arsenic, but also to hinder the access of the poison to running water.

The Art of Thinking and the Habit of Observation.

We have frequently directed the attention of parents and instructors to the importance of teaching children to think, and we now quote, from the Philadelphia *Ledger*, some apposite remarks on the subject.

"In very early life, the perceptive faculties are the principal channels through which we can reach the mind. Closely connected with this subject is the cultivation of the thinking powers. The two are indeed so intimately blended that neither can be effectually improved without some increased development of the other. In learning to see and hear with delicate accuracy, we insensibly strengthen our powers of thought, and accustom them to work more effectively. Still the operation of thinking deserves a far more systematic training than it usually obtains.

"When we are striving for success or excellence in any special pursuit, we think to some purpose. Our will concentrates our thoughts to the point in question, dismisses summarily all irrelevant subjects, presents the matter in its various bearings, with some degree of logical sequence, and rarely allows the mind to drift away from it until some definite result has been obtained. There is a considerable portion of every one's time in which nothing but thinking can be done. There is time spent in cars, where even reading is injurious; and there are times of waiting, resting, and enforced inaction, when the mind has undisturbed opportunity for effective operation. Then, too, there are many employments so mechanical as to claim no portion of the mind's aid. When we have learned to do anything 'without thinking about it,' the thoughts necessarily run in other channels. Much manual labor is of this description. A distinguished prisoner of war, of large mental resources, being allowed to choose his employment while in confinement, selected one so simple as to require neither skill nor thought, assigning as a reason that, though his hands would be occupied by compulsion, his mind at least would continue his own and remain in freedom. We all have some of such work, and many have much. Now, if we had learned to employ this time in clear and consecutive thought—if our will could control our reflections, directing them in definite channels, and aiming to reach some well defined conclusions—we can hardly compute how great an effect would be produced in strengthening our mental powers, in maturing our judgment, in bringing us to the knowledge and appreciation of truth, and thus of increasing our solid happiness and our permanent value to the community.

"The best exercise of every faculty is the chief road to true enjoyment, and no one who has once tasted the pleasures of thinking to a purpose will ever willingly allow his mind to dissipate in wandering thoughts and day dreams. Neither is such discipline so difficult as some imagine. If begun in early life, by awakening the childish interest in what is seen and heard, alluring the mind to reflection by question and answer, and accompanying the thoughts to dwell for short periods, but intently, upon familiar subjects, it will become pleasant exercise, and gradually grow into the habitual tenor of the mind. What we truly will to do is already half accomplished; and the watch thus placed over the thoughts will, of itself, reduce to order and regularity much that is now chaos and confusion. It is by no means necessary that the subjects thus mentally discussed should be remote or abstract. On the contrary, let them be matters familiar to our minds and agreeable to our tastes. Let the memory please us with pictures of the past, and the imagination revel in beauty of scene or heroism of deed. Let the business man revolve the scheme which he longs to execute, and the philosopher meditate on the prin-

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ciples of life. But whatever be the subject, let the thoughts pursue it with a consistent progress that shall eventuate in some real benefit to the mind."

Similar in nature and importance is the habit of rapid and accurate observation, the great value of which was the subject of an address to the Dairymen's Association, delivered by Hon. Horatio Seymour. In the course of his remarks, he said:

"It seems singular that some men pass through life without observing things which come before their eyes almost daily. An intelligent farmer once told me that he would not recognize any of the horses belonging to his neighbors, excepting those noticeable from some peculiarity of color. A Chicago merchant, who daily drove his own horse eight or ten miles, told us he had never noticed any difference in the movement of horses: did not notice the difference between trotting and pacing. A college president is said to have made the question 'in which way do the seeds lie in an apple?' a test of the habit of observation among his students. Our tests with this question would indicate that more than one half of the average men and women either don't know, or will answer incorrectly. We once received a well written essay on the value of observing closely, yet there was not a capital letter or a punctuation mark in the half dozen pages. Many such instances could be given, were it necessary.

"This matter is not one of slight importance. The carefully observant man will see things which will be of pecuniary importance to him, while his ill trained neighbor may lose by not seeing. The farmer with habits of observation will notice slight symptoms of illness in his animals or plants; will readily see the effect of this or that practice; will much more quickly discover countless little things which, if neglected, may result in serious loss.

"As in the case of habits generally, much can be done in childhood, and it certainly should be the duty of parents and other teachers to help children to learn to observe carefully, quickly, accurately. It is told by some one that in his childhood he practiced running past a shop window and then stopping to describe as many articles as he could recall, and in this way he acquired wonderful quickness of observation. There are hosts of points to which a farmer's boy should have his attention called at an early age. Suggestions as to the mode of growth of plants, the form of a leaf, growth of a fruit, or the pointing out of peculiarities of different classes of animals, may do him great good in developing this habit, and also have a marked effect in interesting him in his calling.

"This habit of observation should not be confined to the things we see alone, but should extend to the things we hear, and those we read as well. In this latter matter, there is great lack. Many read to little profit because they have not trained themselves to observe carefully.'"

Correspondence.

Notes from Washington, D. C.

To the Editor of the Scientific American:

In addition to the bill given in your issue for February 13, another has been introduced by Mr. Archer in the House, amending the acts relating to trade marks and labels, which provides for the registry of trade marks, labels, or stamps, for terms of thirty, ten, or five years, on payment of fees of $25, $10, or $6, according to the length of the time applied for; but only half of the two first sums has to be paid in advance. It also provides for reissues and appeals to the District Courts for such cases, in the same manner as in patent matters.

Another bill, introduced by Mr. Hoskins, provides for the patenting of any new and valuable fruit or plant, for the term of seventeen years, with the privilege of an extension for seven years more.

In the Senate, a bill has been passed enacting "that the act approved March 9, 1868, authorizing the issue of a patent for induction apparatus and circuit breakers shall not be construed as authorizing the issue of a patent for any invention applicable to telegraphic apparatus; and any issue, under color of said act, of letters patent for any such invention applicable to telegraphic apparatus, is hereby declared to be null and void, as contrary to the meaning and intention of said act of March 9, 1868." This has reference to the patent granted to C. G. Page for his induction apparatus and circuit breakers, so extensively used in telegraphing.

Mr. Storm has introduced a bill into the House, which enacts "that it shall not be lawful hereafter for any person who has been appointed, or who may hereafter be appointed, as an officer, clerk, or employee in the Patent Office, to act as counsel, attorney, or agent for prosecuting any application for a patent, or an extension thereof, which was pending in said Office while he was said officer, clerk, or employee, nor by any means to aid in the prosecution of any such application, within four years next after he shall have ceased to be such officer, clerk, or employee."

A resolution has been adopted by the House, on motion of Mr. Young, of Georgia, "directing the Commissioner of Patents to inform the House whether patents are now issued for chemical compounds; and if not, why not?"

From all appearances, it would seem that the sewing machine lobby would fare badly, the Senate committee having reported adversely on the Wilson extension; and the House committee have agreed to report the same way, though, I believe, they have not yet done so. The temper of the Senate in this matter of sewing machine extension was shown in the case of John W. Marsh's application for an extension for a patent on a trimming attachment to sewing machines, which came up on Monday last; and although no opposition was made, the bill was refused a third reading by the significant vote of ayes 13, noes 23—the fact that it had something to do with sewing machines being sufficient to kill it.

Notwithstanding this, it is possible that the Wilson extension may go through, as it is said that $250,000 have been raised to influence the right parties to work for its passage; and they will do all that can be done to put the case through. As "there's millions in it," those engineering the matter will do their best, and, by watching their chances, as they did with the Batchelder extension, may succeed in their nefarious endeavors.

The German Parliament has passed an act to protect trade marks, which takes effect May 1 next, and our Consul General at Berlin has sent to the Department of State a translation thereof. The leading features, so far as it relates to persons not residents of Germany, are as follows: "The trade marks of non-resident traders are not entitled to protection in Germany unless they are registered in the Court of Commerce at Leipsic, and unless German trade marks are in like manner protected in the country of the non-resident seeking protection in Germany. The non-resident is also required to file a declaration that he will submit to the jurisdiction of said Court of Commerce in all cases arising under the provisions of said acts, and to furnish proof that in his own country all the conditions are complied with under which the non-resident can claim protection for his trade marks. The right of non-residents to use a trade mark in Germany is limited to the same period of time as is allowed to them in their own country."

Those of your readers who are interested either in art matters or women's rights may like to know that Vinnie Ream has secured a contract to execute a bronze statue, of heroic size, of Admiral Farragut, for which she is to be paid $20,000. The bill authorizing this statue was passed some three years since, and a number of models were sent for inspection, in compliance with a general invitation given to artists to compete; but the committee in charge of the matter failed to agree, and at the last session the selection was referred to a commission, consisting of the Secretary of the Navy, General Sherman, and the admiral's widow, who awarded the contract to Miss Ream.

OCCASIONAL.

The American Institute Rotary Engine Tests.

To the Editor of the Scientific American:

It is an unfortunate trait in the genus *homo* that, as a rule he suffers defeat with a bad grace; and it appears to be an established fact that it is the American specimen which invariably takes the longest time to arrive at a knowledge of the fact that he is beaten in a contest. This peculiar feature of American human nature was quite felicitously illustrated in a conversation of the writer with one of the judges at the late Fair of the American Institute, who had served in that capacity for several successive years; he said, in effect, that when he essayed to judge of the merits of several competing exhibits, he always made up his mind, *a priori*, that, when his judgment was rendered, he would probably be named by all but one of the contestants in terms which, well, would not be appropriate in a religious, or even a scientific, journal. He, in that remark, illustrated very well the chief difficulty under which the American Institute and all similar bodies labor; and it appears to have been no better exemplified anywhere than in the case of the rotary engine tests at the late Fair.

After the results of these tests became known, two of the defeated contestants, and particularly the second best, made quite earnest attempts to bring discredit, by charges of unfairness, upon the writer; and now I see, by an editorial article in your issue of February 20, that, notwithstanding that the original recalcitrants were most irrefragably put to rest by the proper documentary evidence before the Board of Managers of the Institute, there yet remains another malcontent.

The article referred to ("Metaline, and the American Institute"), if not intended, is nevertheless calculated, to reflec upon me, notwithstanding the saving clause ("certainly in one acquainted with the gentleman will venture the assertion that he could be biased, even in prospect of a possible fat commission"); and I desire in reply to it, and in order to calm the troubled spirit of your protestant, or any one else who may be disposed to make themselves unhappy over the result of these rotary engine tests, to say a few words as to the method in which they were conducted, and the precautions taken against possible cavil. The reference to some supposed negotiations of stock, and subsequent business retations of mine with the proprietor of the successful rotary engine, strikes me as a very absurd kind of innuendo: some thing out of the line of the SCIENTIFIC AMERICAN, and altogether foreign to the usual good sense displayed in its editorial columns: I will, therefore, credit it to you in that view.

The writer, in the capacity of Superintendent of the Machinery Department of the American Institute, was directed by Professor R. H. Thurston, Chairman of the Committee of Judges, and by the Board of Managers, to test the competing rotary engines as to power and economy, and report the result to the Committee. In accordance therewith, I made all arrangements for and supervised personally every trial. I therefore hold myself responsible for any error or unfairness, if such can be shown. Professor Thurston, with his customary acumen and forethought, in consultation with myself, decided to send four of the graduating students of the Stevens Institute to attend each of these trials, in order, first that the results might not be questioned by the defeated contestants, and, additionally, to give the young men an opportunity to acquire a little practical information of a kind not so readily obtainable for them at the Hoboken Institute. As an additional precaution, one of the young men, at the conclusion of the trials, made copies of the log, and placed them in possession of Professor Thurston, where they now are. The original logs were left in my possession, from which to compute the results, and are now, with my official report, as a compendium of the report of the Committee of Judges, in possession of the American Institute.

The apparatus used was identical in every case, with the single exception of the brake, a different one being used with two of the defeated engines, in deference to the wishes of the exhibitors of them. When the engines had been run a sufficient time preceding the test to insure average conditions, the control of all instruments and apparatus, together with the recording of all data in the log, was turned over to the four young men above mentioned; and thence to the conclusion of the trial (five hours in each case) I had nothing more to do with it than to see that my instructions, and those of the Judges, were carried out.

Now unless the party from whom you "hear of a protest" intends to impugn the integrity of the young men (some 8 or 10 in all) who actually conducted the trials, as well as my own, he had better hold his peace; and he has every opportunity to check them for himself by consulting the copy of the logs in the possession of the Chairman of the Committee, if he is inclined to doubt the correctness of those at the American Institute.

In a word, I have to say to all (if there are any more) who may be inclined to feel discontented and uncomfortable on this subject that, if they will point out any irregularity or unfairness in these trials, or errors in the results obtained by me, I shall at all times be ready to answer any and all questions; and much desire that the "protest" you mention may make its appearance in some more tangible form than to be merely heard of.

New York city. JOHN T. HAWKINS,
late Supt. Mach. Amer. Inst. Fair.

Air Currents and Air Floats.

To the Editor of the Scientific American:

It is an ascertained scientific fact that the ocean and the atmosphere are correlative in their thermal values. The temperature of the water regulates the temperature of the air. It salts the air as well, and is of vast importance, in this regard, to the products of the soil and the constitution of the animals abounding adjacent to its direct influences.

Along our Atlantic sea board, we have a Gulf Stream pouring its equatorially heated water northeastward to the coast of Newfoundland, whence it is projected over the Atlantic to the coast of Ireland. It is a warm river, of several hundred miles in breadth, running across the Atlantic.

This river is as available for the floating of air ships from our sea board to England as was (and is yet) the Mississippi for floating flat boats from the Falls of St. Anthony to New Orleans.

A balloon, kedged in this stream, will necessarily float along its isothermal line, and it will float much faster than the stream, since the warm air correlated above it will flow in the direction of least resistance, which has an eastward tendency. Can we kedge the balloon in this ocean river? More easily than the water ship can be kedged to the channel of the winding river down which it floats.

With the device termed a droge, a conically shaped bucket float, open at its wide end, suspended at any desired distance from the balloon and fastened with two cords (one at the point, the other at the open end), it is easy to increase or lighten the burden of the balloon; in other words, to let her up or down without a discharge of ballast or gas. Professor Henry hints at the possible contigency of the interference of a cyclone in such an adventure. That is very thoughtful, but the same contingency holds with regard to sea ships as well. To the balloon, it would not be disastrous, as all the cyclones in this latitude are inevitably dragged eastward by the normal motion of the atmosphere, a meteoric fact too often witnessed with my own eyes while sailing in their vicinity, in their midst, or in their front. I know very well that they turn round on their common centers, and that they have innumerable vortices on their peripheries. The destructive vortices are caused by the interruptions on the surface, and would not, even if they extended to the hight of the balloon, be dangerous to it.

Where there is a will, there is a way. Is there not in the land sufficient meteorologic intelligence, coupled with bounteous generosity, to send an air-tossed veteran through this channel for exploration, or some other willing adventurer, more competent than your obedient fellow citizen?

Philadelphia, Pa. JOHN WISE.

Nitroglycerin as a Motor.

To the Editor of the Scientific American:

The idea (originating in a fertile French mind), of superseding steam by an explosive compound far more dangerous than gunpowder, may seem vague; and yet I can see but one obstacle to be overcome in order to make it a success.

The danger of untoward explosions may probably be avoided by keeping the components of the compound in separate tanks, and bringing them together in the cylinder, continuously, as required.

The wants of elasticity and the suddenness of expansion of this powerful substance will probably cause an unsteadiness of motion too violent to be overcome by ordinary machinery, and herein consists the great impediment to its use. And yet it may not be impossible to counteract this defect by employing heavy governors and fly wheels, and by also keeping the amount of the explosive (let into the cylinder at each stroke

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of the piston) down to the minimum, so that it will be required to expend itself in keeping up continuous motion.

In adapting machinery for this use, the size of the cylinder could be reduced in proportion to the increase of the potency per square inch of nitroglycerin over steam.

In regard to the necessity of keeping the constituents of this potent substance in separate vessels until required for use, it is a marvel why this has not been required by law long ere now, as the frequency of awful explosions and the destruction of life and property are sufficient to call public attention to the subject. One might naturally suppose that the Lycurgus of "Free America" is just now taking a Rip Van Winkle vacation from his public duties.

St. Albans, Vt. CHARLES THOMPSON.

[For the Scientific American.]

ANTS.

Every reader is familiar with the ants, at least as referred to in the Book of Proverbs, vi., 6: "Go to the ant, thou sluggard; consider her ways, and be wise." Again, in xxx., 25, we find: "The ants are a people not strong, yet they prepare their meat in the summer." Thus the Scriptures have noticed the habits of the ants, and their wonderful instinct has been described in several articles published in the SCIENTIFIC AMERICAN, The common ants, however, belong to the family *formicidæ*, or genus *formica*, while my subject matter relates to the white ants, which must not be confounded with the common ants, as they belong to a different family, the *termitidæ*, genus *termes*.

Those who are curious to read the wonderful accounts of the warrior termites (*termes bellicosus*, of Smeathman) will find the memoir of Smeathman copied in numerous works on natural history (Maunder; F. A. Pouchet, M. D., in the work called the "Universe," etc., page 185; Westwood, F. L. S., who, in his "Introduction to the Modern Classification of Insects," vol. II, page 11, illustrates and describes several species, all foreign to the United States). Mr. Fitch, in his reports on the noxious and other insects of the State of New York, section 196, says: "American white ant, *termes frontalis*, Haldiman (*neuroptera termitidæ*): Myriads of white ants, mining in and wholly consuming the interior of fence posts and stakes, while the outer surface remains entire." He also says it "is the only species of white ant which we have in the United States." These creatures I have been familiar with for some years, finding them in my rambles among decayed logs in the woods; but have not made microscopical examinations of the various individuals composing the colony, as I have of those I shall now introduce.

My neighbor, Mr. George Hensel, has an extensive greenhouse, and knows how to manage it. He set aside (on a broad shelf, covered with sand and loam, perhaps two inches deep) some choice pelargoniums for cuttings, also some geraniums, and among them a luxuriant echeverria, in the ordinary flower pots. The latter plant was set in its pot upon an empty inverted pot of the same size. Mr. Hensel discovered that these plants, from some unknown cause, were drooping, and to his surprise, in a few days after, discovered that nothing but a thin shell, apparently sound on the outside, was left of the roots and lower portion of the stem. He noticed among the *débris* and soil in the pot, a minute ant-like creature, to which he called my attention; this led me to investigate, and I found that these minute, blind creatures do all their mischief under cover; they build tubular, pendant passage ways (from an upper to a lower field of action) by agglutinating particles of sand, actually forming hollow "ropes of sand" (in which they ascend and descend) eighteen inches long. Under the, sand on the shelf referred to, were tunnels as straight and direct as any engineer could make them, opening up directly under the hole in the bottom of the flower pot, by which they made their insidious approach to the root and stem of the plant it contained; and from this point beneath the pots, three to five such channels were noticed, radiating to various intersecting tunnels. But the most remarkable engineering skill was discovered in the inside of the inverted flower pot. In order to gain access to the roots of the echeverria above mentioned, their tunnels ended on the inner side of the pot at four points; then a tubular column of sand was constructed against the side of the pot (to which it was glued) to within a few inches of the top; then the tubes were built inwards, and met around the hole in the center of the bottom of the inverted pot, through which they established communication with the upper pot; and thus these sappers and miners, with consummate skill, made their attack so completely under cover that no one would suspect their presence, and without injury to the external epidermis of the stem of the plant. Their excavations are all confined to the interior of the plant, in this case a highly succulent one, belonging to the natural order of house leeks (*crassulaceæ*). The fact that they killed one dozen choice plants during December, 1874, proves them to be dangerous insects in the greenhouse. Numbers of winged specimens were discovered in the greenhouse on December 18; these shed their wings in the course of a few hours, and disappeared. Mr. Hensel tells me that he has for years known the common white ants; but the males and females became winged in May, and confined their mining to dry soft wood only. Köllar, in his treatise on insects, mentions the *termes lucifugum* and *ruficolle*, of southern Europe, "where they cause great damage to the olive trees." He writes also of a third species, which he termed *termes flavipes*, "found in the hothouse of the imperial palace at Schönbrunn, where they were, no doubt, introduced with foreign plants. This species does no injury to the living plants, but gnaws through the tubs in which they stand, and the other woodwork of the houses"

I mention these facts simply to warrant me in expressing my opinion that this is a new species, notwithstanding that an eminent entomologist (to whom I presented the facts), on inspection, believes that they are the same as those mentioned by Mr. Fitch, as the American white ant. In that case one thing is certain, they have acquired a new taste, and now relish living, succulent plants, instead of dead and dry wood; or if they had such a taste before, it was unknown to our entomologists. Harris does not mention them in his work, that I can see; nor does any one else allude to their feeding on living plants, with the exception of those mentioned by Köllar, on the olive.

It is well to give publicity to these facts; perchance the same may have been experienced in other hothouses without the culprit being detected or the fact made known.

The ants figured by Westwood and other authors are similar to these, except the class called warriors, with their enormously large heads, fully equal to one half of the whole insect. These do not have the curved or sickle-shaped jaws, crossing at the regularly curved tips; but the jaws are stout, long, and parallel to each other, straight out, but nearly bent at right angles at the tips, which also cross each other near the points. The workers have also very large heads, with no traces of eyes visible on them. The soldiers, so called, are also similarly remarkable, and are all of a uniform dirty white color. Mr. Hensel tells me that the winged members were of a darkish brown color. There seem to be four distinct classes in each colony (Latreille says five, but he includes the larvæ), *pupæ*, neuters, males, and females. They are sufficiently remarkable, and, in scientific engineering, they put to blush some of our learned tunnelers, who, with all their eyes wide open and instruments, can not excel them in finding a point, and hence the ants are entitled to enter an appearance in so classical a paper as the SCIENTIFIC AMERICAN. J. STAUFFER.

Lancaster, Pa.

A Harvest for Plumbers.

The long continuation of intensely cold weather has caused great trouble and discomfort in this city, by the freezing of water in pipes. Probably in more than half the houses the water in pipes has been frozen, or the pipes otherwise disabled. The trouble is generally in the street, where the pipes are most difficult of access, and it arises from the reprehensible practice of builders, who, after attaching the supply pipe to the main, carry the former up to within two or three feet of the surface of the street and then run it to the house, instead of running it in a direct line from the main pipes into the basement of the house, which is always so far below the street as to obviate all liability of freezing.

Persons erecting their own dwellings generally see to having the supply pipe laid as low as the main, or sufficiently deep to prevent the liability to frost; but builders who erect houses to sell save a little by avoiding excavating deep enough to lay the supply pipe below a freezing point, and hence the cause of so much trouble in our households. At the present time there are not good plumbers enough in the city to attend to all the demands, and those skilled in the business are put to their wits' end to execute all their orders

Effects of Poisons on Molluscs.

Professor William North Rice, of Middletown, Conn., states that among the most interesting results of his experiments was the observation that certain poisons, which act with extreme violence upon the mammalia, are very feeble in their action on mollusca. This is especially true of hydrocyanic acid and woorara. Specimens of *illyanassa obsoleta*, immersed in dilute hydrocyanic acid on Friday, showed somewhat feeble signs of life on the following Tuesday. A specimen of *lunatia heros*, into which a quantity of woorara had been injected, was found the next day to show no sign of any injury. Indeed, both of these poisons seemed to produce death very little sooner than the animals would have died in stale water. The sudden introduction of a large amount of carbonic acid in the manner which has been described, seemed to produce no decided effect. On the other hand, chloral hydrate seems to be very suddenly fatal, the animals treated with it becoming instantly contracted, and not resuming their activity when kept for a number of hours in sea water. Cyanide of potassium is similar in its effects, though not quite so instantaneously fatal. The effects of quinine are similar, though less energetic. Chloroform produces instantaneous contraction, and probably death.

Mammoth Cave Fishes.

Interesting additions to our knowledge of the fauna of the Mammoth Cave have recently been made by Mr. F. W. Putnum, of Salem, Mass., who, as a special assistant on the Kentucky State Geological Survey, of which Professor N. S. Shaler is the director, had great facilities extended by the proprietors of the cave, and he made a most thorough examination of its fauna, especially in relation to the aquatic animals. Mr. Putnam passed ten days in the cave, and by various contrivances succeeded in obtaining large collections. He was particularly fortunate in catching five specimens of a fish of which only one small individual had heretofore been known, and that was obtained several years ago from a well in Lebanon, Tenn. This fish, which Mr. Putnam had previously described from the Lebanon specimen under the name of *chologaster Agassizii*, is very different in its habits from the blind fishes of the cave and other subterranean streams, and is of a dark color. It lives principally on the bottom, and is exceedingly quick in its motions. It belongs to the same family as the two species of blind fishes found in the cave. He also obtained five specimens of four species of fishes that were in every respect identical with those of Green river, showing that the river fish do at times enter the dark water of the cave, and when once there apparently thrive as well as the regular inhabitants. A large number of the white blind fishes were also procured from the Mammoth Cave and from other subterranean streams. In one stream the blind fishes were found in such a position as to show that they could go into daylight if they chose, while the fact of finding the *chologaster* in the waters of the Mammoth Cave, where all is utter darkness, shows that animals with eyes flourish there, and is another proof that color is not dependent on light. Mr. Putnam found the same array of facts in regard to the crayfish of the cave, one species being white and blind, while another species had large black eyes, and was of various shades of a brown color. A number of living specimens of all the above-mentioned inhabitants of the waters of the cave were successfully brought to Massachusetts after having been kept in daylight for several weeks, proving that all the blind cave animals do not die on being exposed to the light, as had been stated.—*Nature*.

SCIENTIFIC AND PRACTICAL INFORMATION.

A TUNNEL UNDER THE STRAITS OF GIBRALTAR.

A company has recently been formed in Spain, under the title of the Inter-Continental Railway Company, the main object of which is to unite Europe and Africa by a tunnel under the Straits of Gibraltar. This one, as projected, is to be a right line, extending between Tarifa and Algesiras on the Spanish coast to Ceuta and Tangier on the Morocco shore. The submarine portion will be 44,160 feet in length, or nearly nine miles.

This enterprise offers more difficulties than the similar work under the English Channel, although the latter will have more than twice the length. The maximum depth of the Channel at the point to be traversed is but 163·2 feet, while that of the Straits is 2,621 feet. Supposing that the tunnel under Gibraltar be bored at a distance of 1,000 feet under the bed, its total depth under the sea level would be over 3,600 feet, while the entry and exit galleries would be each three miles in length.

SULPHUR AS A FIRE EXTINGUISHER.

M. Tellier suggests the use of sulphur as a means of extinguishing fire on board ship. The material when burning in the air, as is well known, generates sulphurous acid, in which flame is not sustained. M. Tellier proposes to cover wicks with the sulphur, and to let them down into the burning portion of the vessel, through holes in the decks. Sixty-six pounds of sulphur ignited will entirely absorb the oxygen in 3,360 cubic feet of air; but as only half the oxygen need be removed in order to render the atmosphere unfit to support the combustion, thirty-three pounds are sufficient for the volume mentioned.

Stove Manufacturers In Council.

The stove makers of the United States recently held a convention in Chicago, and adopted the following resolutions:

"Your committee will call to your notice the question of guaranties exacted, by the retail dealers throughout the country from manufacturers, relative to the breakage of castings. Your committee are fully satisfied that the persistent claims made upon our trade for castings to be furnished free of cost upon the simple demand of the retail dealer, and under whatever pretext, has become burdensome and oppressive, and your committee respectfully recommend that in future all guaranties of this character be wholly discontinued.

"Your committee desire to urge upon the convention the great importance of procuring the passage of a law by the Congress of the United States for the protection of the trade against those persons who take our castings and file and fit the same for the purpose of making duplicates therefrom, and supplying the retail trade in the various towns and cities of this country at prices far below the cost of such castings in our own founderies. Every member of the convention must see and feel the great importance of an effort upon the part of not only the convention, but of every member of the organization throughout the country, to put an end to this unwarrantable confiscation of our rights as manufacturers and dealers."

The latter resolution was referred to the Executive Committee. We do not see what more effective laws the stove manufacturers can wish for their protection than they now have. Under our existing patent laws, the most ample protection is afforded the inventor for either any new construction or any ornamental design.

SCHEDULE OF PRICES.

The Committee on Prices submitted the following report, which was unanimously adopted:

"Your committee, having carefully considered the subject referred to them, recommend the adoption of the following basis of prices: The price on common stoves to be 6¼ cents; for the medium class, 7 cents; for the first class, 8 cents; for odd plates, 8 cents: with a suitable amount added for plated knobs, reservoirs, and other extras."

The convention adjourned to meet next June at St. Louis.

OUR staid cotemporary, the Boston *Daily Advertiser*, in alluding to the impracticable measures under discussion by the advocates for rapid transit in this city, and the twaddle on the subject in the daily newspapers, thus sums it up:

"If they want quick transit in New York, why don't they stop talking and go to work and get it? If they are only fooling, they had better go to a business medium. She will doubtless trance it as quickly as anybody."

ON February 10, a fire broke out in the city of Port au Prince, Hayti, caused by the explosion of a kerosene lamp; and the result was that a large portion of the city was destroyed. One thousand buildings, mostly frame, were burned. The city authorities will now, probably, be willing to purchase fire engines, of which they were almost entirely destitute.

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IMPROVED SELF-HEATING FLUTING AND SAD IRON.

The invention herewith illustrated consists of two flat and one polishing irons combined in one, to which, when desired, and by simple means, various fluting irons may also be attached. The essential feature is that the device is self-heating, as its interior contains arrangements whereby gasoline or other light petroleum product is consumed. This, the inventor claims, is easily and safely accomplished at a cost of not over one cent per hour.

The engravings represent a perspective view, Fig. 1, and a sectional view, Fig. 2, the former showing the iron with the fluting attachment in position. The body of the device is three-sided, two sides serving as flat irons and the other having rounded edges for polishing purposes. The rear portion, A, is detachable, and is seated, by means of its flanged hub, upon the fluid supply pipe, B, so as to turn freely upon the latter. It is locked to the body by hooks and shoulders below, and by a spring latch, C, which engages with an inclined shoulder of the body. Suitable perforations are provided in the latter at the apex, corners, and rear, in order to admit sufficient air to the interior to support complete combustion of the hydrocarbon. The supply pipe, B, is firmly secured in the handle stock, D, and passes at a slight inclination into the lower portion of the oil reservoir, E, which last is fastened to the stock. The spring latch, F, shown at the middle of the stock, catches in a recess on the rear portion. A recess is provided in each corner of the latter, so as to fasten the handle similarly when any one of the three faces is turned down into use. G is a pivoted top latch placed beneath the protecting shield, H, which drops into other recesses at the corners of the body and so gives additional support to the handle stock. In order to detach the latch, E, a curved rod, provided for the purpose and shown on the right of Fig. 2, is pushed into the opening at the corner of the body, so that its end shoves the latch clear of the shoulder.

The gasoline is introduced into the reservoir through the faucet shown above, the latter extending down through the receptacle and being seated in the solid portion of the same at the entering point of the supply pipe. Into the latter the oil passes through a groove cut along the faucet, connection being opened or closed by suitably turning the latter. The upper end of the faucet has an orifice for pouring in oil, which is closed by a suitable plug, and also a small vent hole for letting air into the receptacle. By turning this stopper on its seat, the air communication may be closed, thus preventing any escape of the liquid into the supply pipe. The latter, on its outer end, carries a cap piece, back of the flanges, in which small issuing orifices are made. The oil is fed uniformly through cotton or similar material placed in the supply pipe. A burner, I, of triangular shape, divides the flame which heats the sides of the iron.

Fluting irons, J, Fig. 1, of various shapes, double or single, are attached by rear and side lugs, the latter being secured to a V-shaped spring wire, K, which is held by the locking spring, L. This last is seated in one of the corner air holes of the body, and serves to complete the firm connection.

Fig. 1

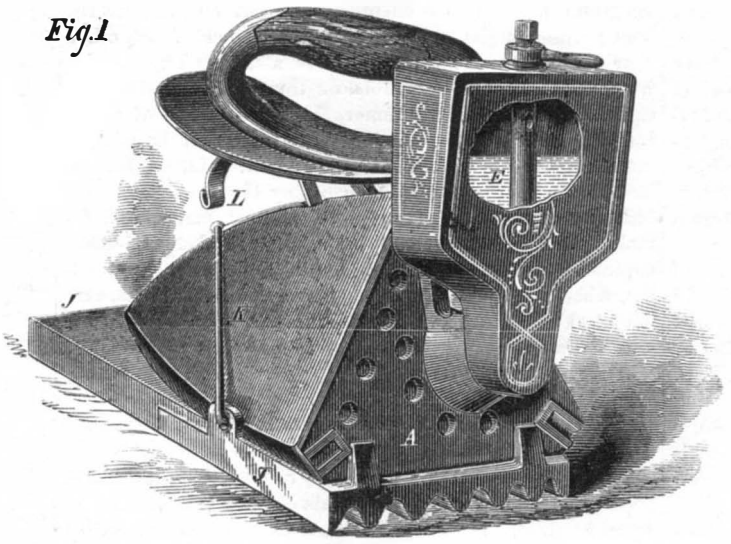
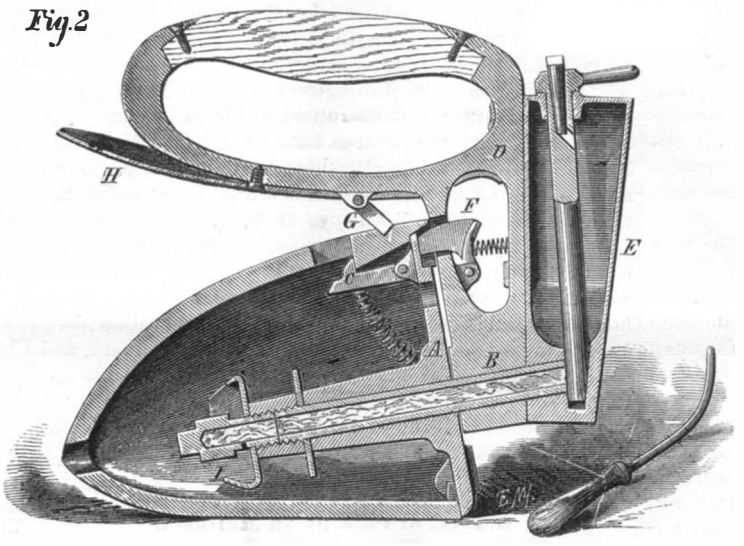


Fig. 2



RAND'S SELF-HEATING FLUTING AND SAD IRON.

Patented February 2, 1875, through the Scientific American Patent Agency. For further particulars relative to sale of territory and rights, address the inventor, Mr. C. R. Rand, 568 Mission street, San Francisco, Cal.

IMPROVED BALE TIE FOR WIRE BANDS.

Wire bands, for confining pressed bales, have, within a few years, to a great extent superseded ropes and wooden hoops, which change is due to the economy, strength, and neatness of wire for this purpose. To obtain the full advantages of its use, the bends should be made large, as short and abrupt bends weaken the wire.

Fig. 1

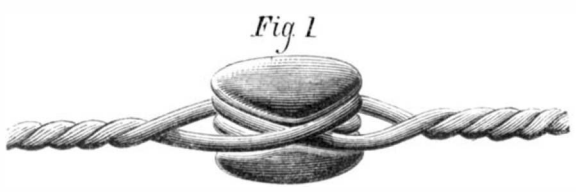
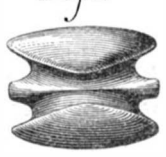


Fig. 2



The tie which is here illustrated is a block of cast iron made in a single piece. By multiplying the patterns a large number can be molded at a time in a single flask. Upon this block, and extending entirely around it, are two similar grooves crossing upon opposite sides of the block. These grooves each receive an end of the wire, so that the wires, when placed in them, cross each other, which brings the two wires into such a position that they draw from the same side of the block, consequently it cannot turn over or be upset by any strain, however severe; and as the wires draw against each other, the strain upon the tie is compressive instead of tensile. This renders the use of cast iron practicable for the purpose. As the wires conform to the bottom of the grooves, they have an easy bend, and retain their full strength. When the angle of the grooves to each other is sufficient to admit of its being done, a spur is placed between them, as shown in the engraving, the object of which is to confine each wire to its own groove. But when the angle is too acute to admit of this, the spur is then placed in one of the grooves over against one side of the tie. Each form has its advantages, depending upon the size of the wire. Before putting the band on the bale, an end of the wire is twisted into one of the grooves, and the other end twisted into a loop, which will just slip over the tie and pass into the other groove. For inserting the tie and forming the loop, the inventor has devised a simple hand tool, with which the purchaser can prepare his own bands. After the bale has been released from the press, the expansion will draw the wire tightly into the grcove and change its shape, so that it cannot unhook in handling. The illustration shows a full sized tie for an ordinary hay band, but a more correct idea of its size may be formed by comparison with a one cent nickel coin, which has the same diameter.

A patent has been allowed for this invention to James M. Albertson, New London, Conn. Information regarding the right to manufacture can be obtained by addressing him as above.

CYLINDRICAL STANDARD GAGES.

Those who have been familiar with the improvements made in machine work, for a few years past, will be able to trace the important influence resulting from the use of accurate and finely divided rules in producing more uniformity in measurement in the different workshops and in the improvement in the quality of individual workmanship. Rules graduated to sixty-fourths and hundreds, and vernier calipers reading to thousandths of an inch were, a few years since, looked upon as hardly of practical utility in machine shops. But in addition to such rules, which are now indispensable, fixed standards are frequently needed for those diameters most used, in order to avoid the errors resulting from measurements taken from rules and vernier calipers, and also to save time. Such standards are of constant use in all regular machine work and are especially valuable because they tend to produce uniformity and interchangeability in the parts of machinery manufactured.

The accompanying engraving illustrates a form of gage claimed to meet this requirement. The first cost is small; and in case of accident or wear from constant use, the device can be readily replaced. Standards of this kind have heretofore been so costly as not to admit of their use by workmen generally, and therefore machine makers have not realized the advantages which will result from their daily use. The diameters are stamped upon each gage in thousandths of an inch, and also in the ordinary fractional parts. The gages are made of best cast steel, hardened and ground accurately to sizes indicated. Parties interested can obtain further information by addressing the Brown & Sharpe Manufacturing Company, at Providence, R. I.

Useful Recipes for the Shop, the Household, and the Farm.

To renovate old feather beds, when no steam apparatus is convenient, put them outdoors during a heavy rain. Let them dry in the sun, beating them occasionally with sticks to loosen the feathers. They should be turned over several times, and thoroughly dried. A paste of soft soap and starch will take stains out of bed ticking. Spread it over the spots. When dry, scrape off and wash with a damp sponge

A good cheap paint for floors is made of five pounds of French ocher, one quarter of a pound of glue, and a gallon of hot water. When well dried, apply one or two coats of linseed oil.

Stains on wall paper can be cut out with a sharp penknife and a piece of paper so nicely inserted that no one can see the patch.

Do not use martingales on working teams. See that the hames are buckled tight enough at the top to bring the draft iron near the center of the collar. If too low, it not only interferes with the action of the shoulder, but gives the collar an uneven bearing.

In removing ink spots from delicate colors, a concentrated solution of sodium pyrophosphate may be employed when oxalic acid or chloride of lime cannot be used without injuring the color.

A membrane of extraordinary firmness may be obtained by dissolving collodion cotton in equal volumes of ether and absolute alcohol, to which a small quantity of balsam of copaiba is added.

Brass, when laid in a leaden vessel containing hydrochloric and a little arsenic acid, assumes iridescent colors, and may be removed when any desired shade of blue is obtained.

A new case-hardening compound, said to be very efficacious for iron, consists of 16 parts lampblack, 18 of sal soda, 4 of muriate of soda, and 1 of black oxide of manganese.

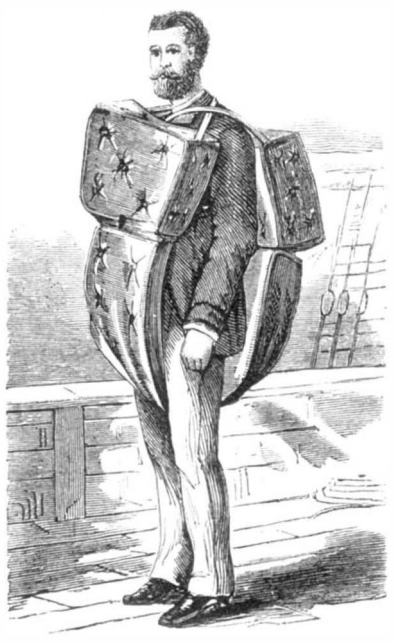
To clean flasks which have contained resinous solutions, wash with caustic alkaline lyes and rinse with alcohol; if they have held essential oils, wash with sulphuric acid and rinse with water.

Blocks of wood intended for veneers may be steamed in a solution of borax and ammonia They will then become soft and easy to cut, and, beside, will retain their flexibility for a long time.

Tracing paper, from which a drawing may be removed by washing, is prepared by first saturating writing paper with benzine, and then immediately coating it lightly with a varnish composed of boiled bleached linseed oil, 20 parts; lead shavings, 1 part; oxide of zinc, 5 parts; Venice turpentine, ½ part. Mix, boil for 8 hours, and, after cooling, add white gum copal, 5 parts, and gum sandarac, ½ part.

LIFE-PRESERVING MATTRESS.

Mr. J. F. Peck, of Springfield, Mass., is the inventor of the novel form of life-preserving mattress represented herewith. The body of the article is stuffed with cork, and it has a pillow or cushion at each end, by means of straps on which it is secured to the person, as depicted in the illustration. The device is designed as an ordinary berth mattress,



and thus requires no extra space for separate storage. When adjusted, it sustains the wearer's head and shoulders above water, and at the same time protects the body from injury by floating wreck, or in coming in contact with rocks. Several of these mattresses, secured together and attached to spars, will make a life raft. Patented March 21, 187[illegible]

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Another American Invention Abroad.

Mr. J. W. Cole, to whom we are indebted for the drawing and description of the miner's shaft published a few weeks ago, is traveling on the European continent in the interest of the Tanite Company, of Stroudsburgh, Pa. He sends home a description of his visit to the works of the *Société de la Meuse,* at Liege, Belgium. He found them using one of their E machines with Tanite wheels. They had two men working on one wheel, and these men were grinding annealed files, which were to be again annealed and then recut. They claimed that these two men did the same work that it formerly required four to do.

This is another instance of the adoption of American machines on the continent. We believe that file manufacturers and recutters in this country have not yet generally adopted Tanite wheels. Is the subject not worthy their attention? It would seem to be, from this account from Belgium.

THE BRETON CATTLE.

We publish herewith a well executed engraving of the bull of the breed of cattle common in Brittany, the extreme northwestern province of France; and it is questionable if there is a domesticated member of the genus *bos* more fully fitted for its situation or surroundings—the right beast in the right place. Living on a poor granitic soil for the most part, among the broom, which, with the scrubby herbage intermixed, forms their chief and in many cases only nourishment, they live and they thrive. Hardy as West Highlanders, Welshmen, or Kerrys, doubtless they are not; the climate of Brittany, though bleak and foggy and ungenial compared with other provinces of France, is less so than that of the mountainous districts of the British islands. Then local circumstances modify considerably the calls made on the hardihood of the breed; they are housed at night, and kept indoors in stormy weather—for the wolf still stalks a dreaded devastator over the length and breadth of Brittany. Shelter and safety, however, are about the extent of what the owner's roof affords (and which in many cases is shared with him as fully and closely as that of Paddy with his pig). A scanty dole of bog hay, and haply a ration of pounded gorse or furze, is all the cottager and the small farmer (who form the majority of the agricultural class) have to bestow.

The effect of such treatment shows itself, as might be expected, in the diminutive size of the breed; and a proof of this being an unmistakable case of cause and effect is the fact that, in every locality to which the breed has been introduced, where the soil is of higher fertility or the system of culture such as to afford good ordinary forage, in a generation or two the progeny becomes changed; the poor, slight, attenuated frame, with the hinder extremities frequently what is called cat-hammed and the concomitant indices of early starvation, developes and expands, and assumes the form of a deep-carcased, shapely animal. It preserves the deer-like head and limbs of its upland progenitor, and surpasses, in the opinion of most people fitted to judge, in its general conformation as a specimen of what is wanted in dairy stock, the far-famed and justly admired Ayrshires--the breed of milk cows, certainly the hardiest as to short and coarse keep that Scotland produces, and which on this latter point at least must yield the palm to the Brittany.

The Ayrshire breed was to some extent introduced into Brittany some years ago, with the intention of effecting improvement in that district; but the effort has proved for the most part an evident failure. The cross formed does not maintain itself on the keep at the disposal of the poor farmers, who form nine tenths of the bulk of the tillers of the soil.

Our engraving, selected from *The Field,* also shows the rustic costume of the peasants of Brittany, who, like their cattle, are endowed with a vitality persistent in spite of poor food and rough living.

Eclectic Dentistry.

Thousands of teeth are ruined annually by the indiscriminate use of heavy, hard, adhesive gold, and heavy mallet force; where they might be saved for years with soft gold, less force used in filling, and less surface exposed to the action of mechanical leverages. If we have proper self-cleansing surfaces between the teeth we fill for such patients, we do more to preserve them by our separations than we do by our filling, by changing the conditions, so that the destructive agents which wrought the ruin cannot again find a lodgment. The proof of this assertion can be observed where a tooth has been extracted and the adjoining one has a superficial carious cavity on the face which was in contact with the extracted tooth. It will often remain for years without farther change. This example proves the efficacy of self-cleansing surfaces as a preventive of decay.

Gold continues to be the material *par excellence* for filling teeth, where the tooth structure is of sufficient strength for the gold to be impacted into the cavity without fracturing its walls. There are certain exceptional cases, in the posterior teeth, where a good amalgam plug will serve a better purpose and save the teeth longer.

In the preparation of gold foil for filling teeth, we cannot be too careful not to handle it; for however clean we may wash our hands, there are more or less of the excretions of the system oozing from the pores of the skin. The fact can be easily demonstrated by rolling or folding one strip of gold thus, and another on a clean napkin or piece of spunk with a nickel-plated spatula, and then passing each piece through the flame of an alcohol lamp. From the former there may be seen steam and smoke arising, while in the latter we cannot discern either.

Tin, amalgam, Hill's stopping, and oxychloride of zinc are all good materials for filling teeth, where they are properly used. I think it is not improbable that at no distant day a plastic material will be discovered for filling teeth, that shall possess all the good qualities of gold with none of its objectionable ones. The man who shall make this much-needed improvement will most certainly be a benefactor of his race.
Dr. G. B. McDonneld, in Dental Cosmos.

Kentucky China Ware.

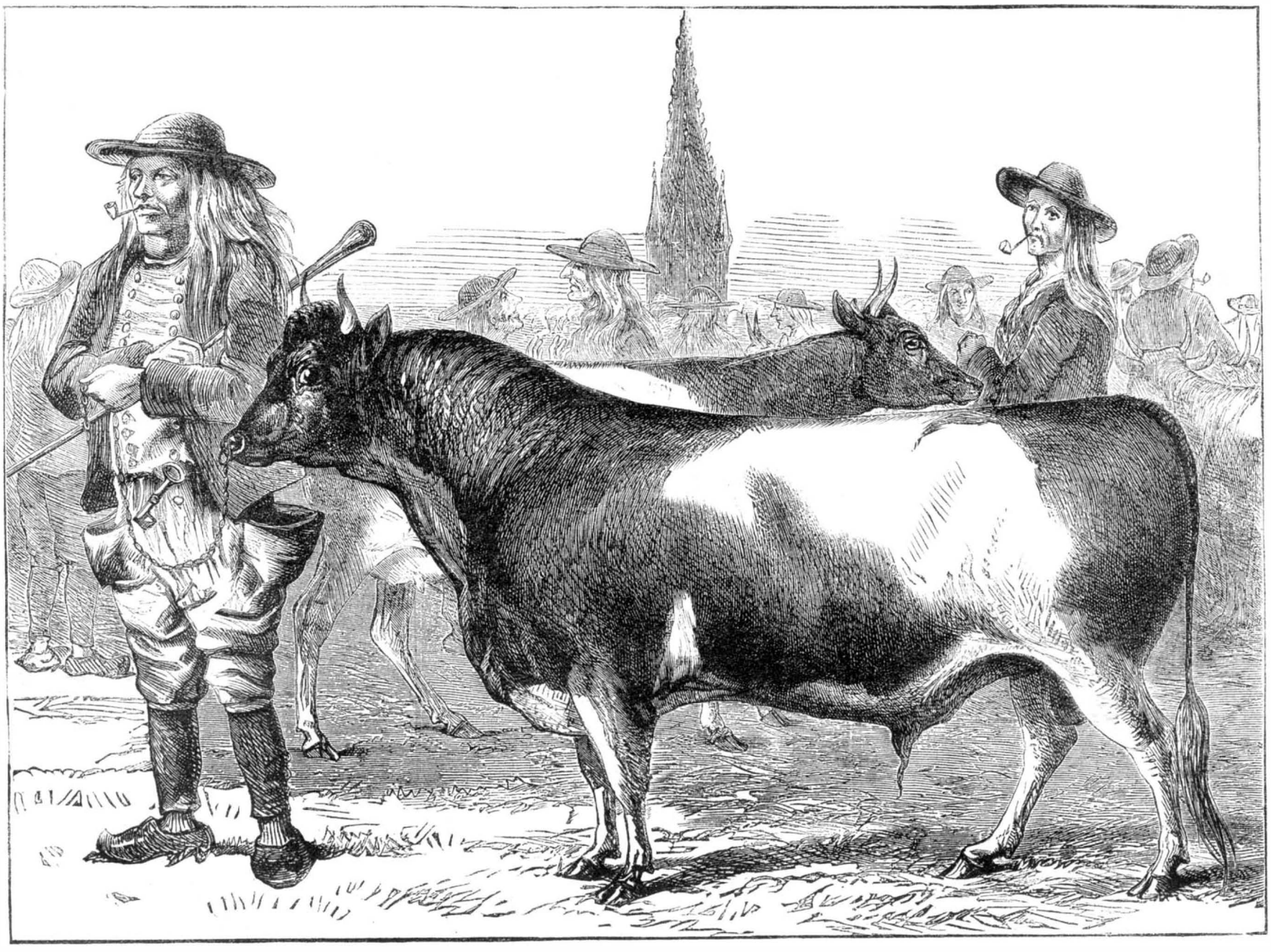
The *Southern Agriculturalist,* published at Louisville, Ky., takes its neighbors to task for not establishing the manufacture of china ware in their State, which, it claims, abounds in the requisite material for the purpose. The editor, in enforcing his views, says that its production has established an industry that employs a capital of $100,000,000 in England, and as much more in Germany and France.

"Crittenden and Livingston counties in Kentucky contain an unlimited deposit of pure china clay, known among china manufacturers as kaolin, called by ancient pottery men 'petuntse,' which is simply decomposed felspar. It is refractory, resists the most intense heat; in fact it is not fusible by any degree of heat, but assumes a strong consistence in the furnace. A deposit of this clay also exists near Golconda, in Southern Illinois, which supplies a large establishment located at Trenton, N. J., where it is ground, elutriated, made into china ware, baked, glazed, and passed through the various manipulations necessary to produce a marketable article, and then shipped back and sold to our good people, who, of course, glory in their indedendence, or exult in the progress they are making in manufacturing, and perhaps do not really know that they pay an exorbitant price or profit for the privilege of sipping coffee out of a cup made from their own soil.

If this crude clay can be shipped a thousand miles, made up into china ware, shipped back, and then be sold at large profits, why cannot it be manufactured in Kentucky at much greater profit, and still be sold at present prices? Kentucky's wealth in this material is not known, or, if known, our good people are too indifferent or careless to appreciate it. In the district where these immense deposits of china clay exist, there is also to be obtained, near the surface of the ground, an unlimited supply of fluor spar, French chalk, steatite, fire clay, yellow ocher, lead, iron, and coal. Not only china ware can be made out of these clays, but porcelain, glass, drain and sewer pipe, terra cotta, fire brick, etc., and yield a profit of fifty per cent on the investment, and still undersell present prices."

[If the statement of our contemporary is not overdrawn, Kentucky would seem to be the State producing all the material necessary for the successful manufacture of china tea sets.—EDS.

THE *Revue Industrielle* states that sour milk, after protracted exposure to the sun, developes a poisonous quality, sufficient to cause disease and death to pigs fed thereon.



BRETON CATTLE

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Bee Keeping in 1875.

A writer in the *Journal of Horticulture*, England, gives the following hints on bee keeping, adding his own experience on removing dead bees from the hive. If the writer's observations are correct, that the best honey seasons follow the coldest winters, certainly the coming summer must be a productive one in this country.

"I have often observed that our best honey seasons, and they are of rare occurrence here, have followed our coldest winters. Therefore I augur hopefully for the summer before us. It is now (January 16) so warm, and has been for some days, that a fire might have been dispensed with. At this moment I am sitting with my window wide open, facing north, and my bees have been busy pollen gathering. I noticed this pleasant sight for the first time on the 12th, but I have no doubt they were at it some days before, during my absence from home. All my hives, eleven in number, seem to be in good health, and well supplied with provisions.

It is a good thing when the weather is open, as at present, to clear away as many dead bees as can be got at within the the hive without breaking away the hive from its board. This can frequently be done by inserting a piece of wire with a curve at one end, and hooking out the dead on the floor board. The effluvium arising from a mass of corrupting bodies is often very great; and after a long period of cold weather, there is sure to be a considerable quantity of such dead bodies lying about the floorboard inside. The bees ordinarily remove their dead themselves from day to day, when they can get out; but it helps them much to assist them in this labor, besides adding to their health and comfort. Where wooden hives are used, no harm can accrue from breaking up the hive from its board in any case where these fit accurately. It is in the case of straw hives, which rarely sit evenly on the board, that it is perilous to remove these boards in winter. Sometimes I have known the dead accumulate so thickly about the entrances inside as to choke them up entirely, in which case, there being no exit for the bees, the hives perish inevitably. Let all bee keepers watch against eventualities like these, as well as against long-continued accumulations of snow outside on the entrance boards.

These hints are not untimely, as we shall doubtless, ere long, be visited by a sharp increase of cold, all the more severe for the present extraordinary warmth of temperature.

Since writing the above, I have been examining my hives, and found ten out of the eleven pollen gathering, some of them quite vigorously. One hive, active and strong, on inspection by a window at the back, seemed to have a large number of dead scattered below the combs. So being a "good divine that follows his own instruction," I quickly heaved up the hive by means of a screwdriver, and, with a thin stick, swept off right and left about thirty dead bees, whose fragrance was not of the sweetest."

American Plumbago or Graphite.

Plumbago is found in almost inexhaustible quantities in Ceylon, and there are mines capable of producing vast quantities in several States on this continent. The *American Manufacturer* says, however, that repeated trials have been made, and a large amount of capital expended, to work these mines profitably, resulting (with one exception) in failure.

The only plumbago mines in the United States successfully worked are located at Ticonderoga, and are the property of the American Graphite Company, 24 Cliff street, New York. This company has been running its works constantly since their erection in 1863. The mines, however, have been worked for half a century. Those at Ticonderoga yield the foliated, while one at Warrensburg, thirty miles south, contains the granulated.

The American Graphite Company, under the management of Mr. Cyrus Butler, were the first in the world to attempt the purification of plumbago ore in a large way.

The company now produce every quality, adapted for all purposes for which black lead is used. For lubricating purposes, for which there is probably nothing superior, the plumbago must be perfec ly pure; and the article produced by the Graphite Company possesses, in a remarkable degree, this qualification, superseding in lubricating qualities even the Ceylon plumbago, the latter being too soft and spongy. The works at Ticonderoga purify the ores, producing an article pure and safe to use in any situation.

Plumbago is infusible, insoluble, and practically indestructible. It is affected neither by extremes of heat or cold, nor by acids or gases. On bearing surfaces, particularly those of iron, steel, and wood, it fills up the interstices and forms a slippery glaze, thus removing the cause of friction.

A Cure for Lockjaw.

In the course of lectures, recently delivered before the British Society of Arts by Dr. Benjamin Richardson, the following important remarks were made upon nitrite of amyl:

'One of these specimens, I mean the nitrite of amyl, has within the last few years obtained a remarkable importance, owing to its extraordinary action upon the body. A distinguished chemist, Professor Guthrie, while distilling over nitrite of amyl from amylic alcohol, observed that the vapor, when inhaled, quickened his circulation, and made him feel as if he had been running. There was flushing of his face, rapid action of his heart, and breathlessness. In 1861-62 I made a careful and prolonged study of the action of this singular body, and discovered that it produced its effects by causing an extreme relaxation, first of the blood vessels, and afterward of the muscular fibers of the body. To such an extent did this agent thus relax, I found it would overcome the tetanic spasm produced by strychnia; and having thus discovered its action, I ventured to propose its use for removing the spasm in some of the extremest spasmodic diseases. The results have more than realized my expectations. Under the influence of this agent, one of the most agonizing of known human maladies, called *angina pectoris*, has been brought under such control that the paroxysms have been regularly prevented, and, in one instance at least, altogether removed. Even tetanus, or lockjaw, has been subdued by it, and in two instances, of an extreme kind, so effectively as to warrant the credit of what may be truly called a cure."

NEW BOOKS AND PUBLICATIONS.

CATECHISM OF THE LOCOMOTIVE. By M. N. Forney, Mechanical Engineer. Price $2.50. New York city: Railroad Gazette Office, 73 Broadway.

This admirable handbook fills a place in our technical literature which has long been vacant. Although, with commendable candor, the author acknowledges that the plan and title of his work are adapted from Kosak's book on the locomotive, the substance of the articles is so exclusively founded on American practice that it is virtually an original treatise. It is authoritative and accurate in its description of the constructive of the modern steam horse; and it gives many valuable precepts for the manipulation and running of the engine, which have never before, we believe, been printed in any form. The numerous enquiries on these subjects which we receive from all parts of the country are the best proof of the necessity and value of this book.

SCIENTIFIC LONDON. By Bernard H. Becker. New York city: D. Appleton & Co., Broadway.

The author has made a very interesting volume of historical and descriptive sketches of the Royal Society, the Royal Institution, the Society of Arts, the Institution of Civil Engineers, the British Association, the Royal Geographical Society, and several other learned bodies, more or less known to fame. The papers originally appeared in the columns of *Iron*.

GRAPHICAL METHOD FOR THE ANALYSIS OF BRIDGE TRUSSES, extended to Continuous Girders and Draw Spans. By Charles E. Greene, A.M., Professor of Civil Engineering, University of Michigan. Illustrated by Three Folding Plates. Price $2.00. New York city: D. Van Nostrand, 23 Murray and 27 Warren streets.

This treatise elaborates a method of investigating the stress on roofs and trusses, originated by Professor Clerk-Maxwell; and it shows once more the value of the graphical method of describing the physical characteristics of complex bodies, a method which seems destined to be adapted to every branch of mechanical and dynamical science. The author points out, with much force, that not only is the system available for the solution of the problem of the strains on a girder, the dimensions of which are given, but it also contains a means of checking the accuracy of the working drawings of the structure.

CHEMICAL EXAMINATION OF ALCOHOLIC LIQUORS. By Albert B. Prescott, M.D., Professor of Organic and Applied Chemistry in the University of Michigan. New York city: D. Van Nostrand, 23 Murray and 27 Warren streets.

This volume is a useful and trustworthy aid to the analysis of all such alcoholic fluids as are used as food or stimulants. It discourses on the question of adulteration in a sensible and practical manner, and contains statements that go far to justify immediate government interference with the trade of the falsifier.

THE OVERLAND MONTHLY. Devoted to the Development of the Country. Terms $4.00 per annum. San Francisco, Cal.: John H. Carmany & Co., 40 Washington street.

This excellent magazine maintains a well earned reputation. The number now before us (February, 1875) commences with an interesting account of the naval duel between the Kearsarge and the Alabama.

A PRACTICAL TREATISE ON THE GASES MET WITH IN COAL MINES. By the late J. J. Atkinson, Government Inspector of Mines, England. Price 50 cents. New York city: D. Van Nostrand, 23 Murray and 27 Warren streets.

A useful and readable essay, published in Mr. Van Nostrand's Science Series.

THE AMERICAN EDUCATIONAL CYCLOPÆDIA, a Reference Book for All Matters Pertaining to Education. Published Annually Volume I, 1875. Price $2.00 in cloth, $1.50 in paper. New York city: J. W. Schermerhorn & Co., 14 Bond street.

This volume is a complete manual of the statistics of the educational condition of all the States and Territories, with a synopsis of the occurrences affecting the question during the years 1873-1871. Some biographical sketches of prominent educators recently deceased, and articles on the educational systems of other countries, add much interest to this useful work, an advertisement of which appea 's on page 157.

DECISIONS OF THE PATENT OFFICE.

BEFORE THE BOARD OF EXAMINERS-IN-CHIEF. PRESENT: MARCUS S. HOPKINS, R. L. B. CLARKE, CONCURRING.—APPLICATION OF MILLER T. GREENLEAF AND GEORGE Q. ADAMS FOR A PATENT FOR A CAR COUPLING.

Continued from page 139.

Our position is a peculiar one with respect to the Commissioner. We are a tribunal vested by statute with certain jurisdiction and powers, but it has never been judicially determined under the present patent act that our favorable decisions, made in the proper exercise of statutory jurisdiction, upon *ex parte* applications, are binding upon the Commissioner. We are no more than a *quasi* judicial tribunal. The Commissioner's office is both executive and *quasi* judicial. The whole Patent Office and all its officers are a portion of the executive branch of the government, and not of the judiciary. None of us have full judicial powers and the ordinary means of sustaining the exercise of t hem. Just what is the legal scope of the power of the Board and the effect of our decisions—upon cases appealed to us as a *quasi* judicial tribunal within the Patent Office, wh ch is under the general direction of the Commissioner as its head—has long been, and still is, a disputed question between the Commissioner and appellants before us, who have sought to invoke our favornble decisions, as sufficient to warrant him in the grant of patents. This question is now actually pending before the Supreme Court of this District in a suit brought for the purpose of determining it. The opinion of the court in Snowdon *vs.* Pierce (manuscript decisions, Supreme Court, D. C.), referring to the act of 1861, although going clearly to the root of the matter, and strongly and unequivocally declaring our judicial independence of the Commissioner, and the reason for it, had not the force, in the opinion of Commissioner Fisher, of a judicial decision of the point. (Commissioner's Decisions, 1869, page 68.) He regarded it as merely *obiter dictum*, and declared that the question was an executive one, that ought to go to the Attorney General. His decision, like that of Judge Dunlop in Snowden *vs.* Pierce, referred to the act of 1861, and sharply disputed the ground taken by the court. The present act, however, is not identical with that of 1861. In fact it appears to be materially different. Beyond the difference indicated from a consideration of it in the light of the ordinary rules for the interpretation of statutes (namely, regarding the words, the context, the subject matter, the effects and consequences, and the spirit and reason of the law), the following extract from the records of the House of Representatives, relating to the passage of section 10, by that body, are not without significance:

"*Mr. Butler, of Massachusetts:* Now he (the Commissioner of Patents) has under him a Board of Examiners, who are nominated by the President and confirmed by the Senate, and who are quite his equals in every respect. I understand that the opinion of the Committee on Patents is that this provision, as to establishing rules and regulations for the proceedings, does not apply to the conduct of the employees of whatever class. But the difficulty is that the Commissioner of Patents has made a series of time tables, and other rules and regulations covering the acts of the employees, which he has applied to the Examiners, who are his equals and coördinates, and who ought not to be in any way under him. Therefore I want to put in this language to exclude the idea of his having any such power. I am willing that he should govern his clerks and laborers and all who hold under him, but I am not willing that he should have the power of annoying and disturbing, if he chooses, the men who are appointed by the same power as he is, and with the same rank.

"*Mr. Jenckes*: I think I can show the gentleman from Massachusetts that his amendment is not needed. This power to make the rules and regulations is to apply to the *proceedings* in the Patent Office, and *not* at all to the persons employed there; and the rules and regulations to which the gentleman refers, and of which he complains, are made by the Commissioner under the power in the existing law, which is reprinted in this bill at the end of section 10 in the following words:

'They shall be governed in their action by rules prescribed by him.' (Act of 1861.)

That power *we propose to take away*. It is part of the recommendation of the Committee that these words be stricken out from the existing law, and that the power which the Commissioner shall have and ought to have shall be that of regulating the manner in which proceedings shall be conducted in his Office; the rules of court, so to speak, *not the rules of decision but of government*. I hope that gentleman will withdraw his amendment.

"*Mr. Butler, of Massachusetts:* The explanation which the chairman of the committee on patents has put on record will obviate the necessity of the amendment I had proposed. I therefore withdraw my amendment. But I desire to make another, in the ninth line of the tenth section. The section, as reported from the committee, reads thus:

'The Examiners-in-Chief shall be persons of competent legal knowledge and scientific ability, whose duty it shall be, on the written petition of the appellant, to revise and determine the validity of the adverse decisions of Examiners upon application for patents; and for reissues of patents, and in interference cases: and when required by the Commissioner, they shall hear and report upon claims for extensions, and perform such other duties as he may assign them.'

I want to strike out the words '*he may assign them*' and insert in their place the words 'may be assigned them by law.' The chairman of the committee will see that under the words 'and perform such other duties as he may assign them' the Commissioner might—though that would not be very likely, yet he might—put them to sweeping out the Office. The duties should be assigned them by law and not by the will of the Commissioner. That is the point I desire to make.

"*Mr. Jenckes:* The language which the gentleman objects to is the language of the exis ing law. As there is no hardship under it, we did not take the responsibility of recommending its alteration.

"*Mr. Butler, of Massachusetts:* Ah! But the difficulty is that under the old law the Commissioner has shown a disposition to interfere, which the committee by this bill seek very properly to regulate.

"*Mr. Jenckes:* We thought we met that objection sufficiently by taking away the power to assign duties in the Office. But there are many things in which the Commissioner might wish the services of the Examiners-in-Chief, but which it would be very difficult to prescribe definitely by law.

"*Mr. Butler, of Massachusetts:* Then I will compromise by moving to substitute the word 'like' for the word 'other,' so that it may read 'such like duties as he may assign them.'

"*Mr. Jenckes:* I have no objection to that. * * * * * The amendment was agreed to." (Cong. Globe, Part 4, 2d. session, 41st. Congress—1869 and 1870, p. 2,855.)

This authentic record history of the passage of section 10, defining the duties of the Board, like the language) of the section itself, plainly shows the intent of the law-making power. The section must be read in connection with section 7 defining the duties of the Commissioner, and both sections must be construed together so that each shall stand—the rule being "*ut res magis valeat quam pereat.*"

Section 10, following after section 7, and conferring special powers on the Board, must be held to restrict the meaning of section 7, giving general powers to the Commissioner, if it can be supposed that the two sections are in apparent conflict. But it is plain to us that they are not—that section 7 relates wholly to executive and ministerial duties, over which it provides the Secretary shall have "direction," and not at all to judicial duties. Sections 46 and 47, providing for appeals, confer upon the Commissioner his judicial powers, in the exercise of which he is independent. These sections, in connection with section 10 (with none of which do any other sections of the act in the least conflict), make the law as plain as language can well make it.

It is clear we must in our judicial capacity be, in a certain measure, independent of the Commissioner, and our decisions, favorable to appellants, be binding upon him and all others, so far as the duty of granting patents is concerned (except fraud should appear), or el se we must be wholly subordinate to his judgment, and our favorable, as well as adverse decisions, be liable to be overruled by him at his pleasure. We are either an independent tribunal in this Office with appellate jurisdiction, to relieve the Commissioner of all judicial responsibility, except in cases regularly appealed to him from our adverse decisions, or else we are mere clerical reviewers of a portion of the work of Examiners, to aid the Commissioner, subject to his dictation in forming our opinions, and wholly depending in all cases upon his approval of the judgments we pronounce. There is no middle ground. But if the former be the correct view of our powers and responsibilities under the law, it is undoubtedly competent for the Commissioner, in order to prevent the erroneous issue of a patent, in any case where in his judgment there is reason why it ought not to issue, to refuse to issue it, and to refer it to the Board for their consideration and review of the alleged matter of error. And if the Board, for any cause, should fail to agree with him as to the judgment, then he might still refuse to execute and grant the patent, and the existence of the alleged error, to warrant them in the alteration of their sufficiency of his reason for refusing could be tried before the Supreme Court of the District on application for writ of *mandamus*, and then on appeal before the Supreme Court of the United States. This would seem to be ample provision against the erroneous issue of a patent or a dangerous exercise of a power of independent judicial action by the Board. But the presumption is that officers of the intelligence and dignity of Commissioners and members of this Board would endeavor to do their duty, and to avoid conflicts; and we apprehend cases of irreconcilable difference of opinion, of such importance as to involve litigation, would seldom occur. Were each tribunal (the Commissioner and the Board) *purely* judicial, instead of administrative and *quasi* judicial, each would have a distinct jurisdiction and be as independent of the other in the Office within that jurisdiction as supreme and subordinate courts; and the first duty of each would be to define its own jurisdiction and act accordingly. In that state of things no Commissioner would ever have questioned our judicial independence, and it would be admitted to be our duty to pass upon this case independently of the Commissioner: coming to us as it does, without any very recent action of his upon the question at issue, and with the recent decisions of the courts, as we think, clearly controlling that issue. The case does not appear to be very different than if a new statute had in the meantime been enacted, declaring a rejected and abandoned application insufficient. It is only the mixed nature of the official duties in this Office that has raised a doubt of the distinct distribution of them by law. But from the language of the statute, and the necessities of the case, we can have no doubt that we are required to *adjudicate*, and not merely to report upon cases duly appealed to us, and, in doing so, to exercise ordinary judicial freedom of judgment. We are to "revise and *determine* upon the adverse decisions of Examiners." Appellants who pay their fees and employ counsel to argue cases before us are entitled to such adjudications, and to have them enforced so far as they are legally effective. Otherwise they do not obtain their *quid pro quo*, and appeals to us and adjudications by us would be farcical. Nothing can be plainer than that in all executive matters relating to the proper transaction of our business—matters of mere practice, or mode of procedure, etc.—we are, with great propriety, subject, under the law, to the control of the Commissioner. Nor can anything be clearer than that, upon points that have come judicially before him, upon regular appeal from our adverse decisions upon them, and been decided by him, we are bound to follow his decisions to the extent of their legitimate intendment and effect, until they are unmistakably overruled by higher authority. Beyond that, it is our opinion, upon the most careful consideration, we are not subordinated to him by law, in our judicial capacity. Nor do we perceive any anomaly, or any change to the public, from such a fact. The Secretary of the Interior has full supervision of the Commissioner and all other officers in the Patent Office, in all executive and ministerial matters. But the Commissioner is vested, by section 47 of the statute, with certain judicial functions, in the exercise of which he is entirely independent of the Secretary; and we know of no instance of the Secretary's attempted interference with respect to them. Following the necessity of the case, in order to enable the public business to be done, the law has made the Commissioner thus independent. Following the same necessity, growing out of the magnitude of the judicial work of this Office, the whole of which it is impossible for the Commissioner to perform and be held judicially responsible for, the law, we think, has made the Board, within the limits above named, independent of the Commissioner. This being so, our legal duty, from which there can be no conscionable escape, requires us to pronounce our judgment upon the issue in this case. We could not be justified in letting it go to the Commissioner with a *pro forma* affirmance of the rejection by the Examiner, thus compelling the party to pay his appeal fee of $20 and the other expenses incident to such an appeal. There are many considerations, w hich we duly appreciate, in favor of the greatest courtesy and deference, and of a harmonious exercise of the functions of the different tribunals within this Office. But official ethics cannot require or warrant the deprivation of a legal right of a suitor, by the withholding of its own proper judgment, under circumstances like the present, by a lawful and responsible tribunal. We should greatly have preferred that so important a matter be first enlightened by a decision of the Commissioner; and in order to get this case before him for decision, we have proposed to certify it up to him, in analogy to the practice sometimes adopted by the Supreme Court of this District, so as to save the appellants their appeal fee. The Commissioner, however, not approving of that course, we must reverse the decision of the Examiner, and his decision is hereby overruled. We recommend, however, that he call the Commissioner's personal attention to this case, on account of its peculiarity and importance.

MARCUS S. HOPKINS, *Examiner-In-Chief.*

I concur with the views in regard to the insufficiency of the references, and unhesitatingly unite in a decision reversing the examiner's rejection.

A plain question of law based on admitted facts as presented for our adjudication is in fact the only point relied upon by the appellant.

We find that the examiner erred in holding the invention anticipated by a rejected and abandoned application.

We have the highest authority known to our judiciary to sustain the point made by appellant.

We have the repeated decisions of the circuit courts—as cited—to the same effect.

We have the principles and reasons underlying the law to sanction it to our good sense and judgment.

All we have to do, in the discharge of our duties under the statute giving us power and jurisdiction, is to find and record our judgment.

If done honestly and intelligently, the Commissioner can have no occasion to except to our action.

His power is ample to guard against any evil effect from our finding.

If he thinks a patent should not issue for *any* cause, he has only to refuse, and it will not issue.

If called to give his reasons upon *mandamus*, his action would be undoubtedly sustained if his reasons should prove good and legal.

I do not believe in forcing parties to pay fees and go to the Commissioner on questions which the law contemplates as within our peculiar province and jurisdiction, and which we should decide on our own consciences and according to our best judgment.

R. L. B. CLARKE, *Examiner-In-Chief.*

Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]

From January 15 to February 1, 1875, inclusive.

BURNING LIQUID FUEL, ETC.—C. E. Robinson, New York city.

COATING METALS, ETC.—D. R. Brownlow *et al.*, Middletown, Conn.

CUTTING FABRICS.—A. H. Cramp (of New York city), London, England.

DYEING AND FINISHING.—P. Magner *et al.*, New Orleans, La.

FUR-COATED FABRIC.—H. Kellogg, Milford, Mass.

HEAD COVERING, ETC.—H. Kellogg, Milford, Mass.

MAKING ICE, ETC.—C. P. N. Weatherby (of New York city), London, Eng.

PRESERVING ANIMAL SUBSTANCES, ETC.—J. R. McClintock, New Orleans, La.

PREVENTING FRAUDS BY CONDUCTORS.—C. G. Imlay, Philadelphia, Pa.

ROLLERS FOR TEXTILE FABRICS.—E. Edwards, Boston, Mass.

ROLLING NUT BLANK BARS.—G. Johnson, Haverstraw, N. Y.

SACK SEWING MACHINE.—H. P. Garland, San Francisco, Cal.

SEWING MACHINE.—E. Moreau, San Francisco, Cal.

SPIKE MACHINE.—A. Whittemore, Cambridgeport, Mass.

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Recent American and Foreign Patents.

Improved Die for Making Hollow Rings.

Shubael Cottle, New York city, assignor to Mulford, Hale and Cottle, of same place.—This invention has for its object to produce circular and oval hollow rings from a disk of sheet metal, and without any cross seam, for use in manufacturing chains, buttons, studs, and other articles of jewelry. The operation is accomplished by an ingenious series of dies and cutting tools, which force the metal by degrees into the proper shape.

Improved Barbed Stock Fence.

Francis T. Wilson, Ames, Iowa, assignor to himself and E. J. Bartlett, of same place.—This invention consists of barbs combined with the longitudinal rods of a fence, to prevent cattle from rubbing and pressing the rods apart or down to pass the fence. The said barbs consist of short pointed pieces of wire inserted in an eye in the rod, crossing each other, and secured by a staple, so as to point in four directions, and be securely held when the rod is strained up tight.

Improved Saw Sharpener.

Joan Crook and James A. Crook, Augusta, Ohio.—This invention consists of emery wheels adapted for dressing both sides of the teeth and gumming the saw, together with driving gear and adjusting devices, and a spring clamp mounted on a radius bar contrived to be contemporarily attached to the collar of a circular saw, all so arranged that the wheels can be readily applied to the teeth, so as to dress them all alike and do the work expeditiously.

Improved Seed Planter.

William C. Reynolds, Collierstown, Va.—This invention consists in a false bottom, for seeder hoppers, provided with subjacent support and side apertures, designed to relieve the slide from the weight of the seed, and so remove the liability of the aperture to become clogged.

Improved Bandage Winder.

Alfred M. Cone, Corry, Pa., assignor to himself and L. D. Parsons, of same place.—A spindle, made square in cross section, passes through the upper end of a frame and has upon its end a crank, by means of which it is revolved. The bandage is wound around this spindle by revolving the spindle rod. A rod is attached to the frame, and is soldered to the end of the arm, so as to leave a narrow space between the rod and the arm. The cloth or bandage is passed through this space and carried to and around the spindle with any degree of tightness by bearing lightly with the hand upon it below the space or rod. When the bandage has been wound on the spindle, it is readily slipped off.

Improved Steam Condenser.

Edwin O. Brinckerhoff, New York city.—Two steam and watertight cases are placed the one within the other. A space is left between the tops, bottoms, and sides of the said cases. A double-acting pump discharges into two U pipes. The upper end of one of the U pipes and the lower end of the other pass through the side wall of the outer case, and discharge the cold water into the space between the case, whence it escapes continuously through the waste pipe. The upper end of the other U pipe passes through the walls of both the cases, and is connected with the upper end of a coiled pipe, placed within the inner case, and the lower end of which is connected with the steam and watertight box upon which the coil stands. The lower end of the other U pipe passes through the walls of both the cases and enters the box, so as to discharge a stream of cold water directly into the said box. The exhaust steam pipe passes in through the tops of the cases, and discharges the exhaust steam into the upper part of the inner case, where it is immediately condensed by the streams of cold water passing continuously through the space between the cases.

Improved Top Joint for Vehicles.

Thomas F. Darcy, New York city.—This top can be readily raised and lowered by the occupant while sitting in his place on the seat. The knuckle joints of the braces are made so as to fold forward or toward the pivots of the bows, instead of backward, as heretofore, and are attached to a shaft at the lower end, having a spring applied to it, so as to raise and hold the top up. The lever, to press it down, is provided with a lock catch to hold the top down, or in any intermediate position. It is also arranged to lie down on the cushion out of the way when the top is down, and to stand up alongside of the back when the top is up.

Improved Feed Roller for Planing Machines.

Samuel N. Brown and Henry W. Meyer, Dayton, Ohio.—This invention consists of a feed or pressure roller for planing machines, made of an interior cushioning sleeve of elastic material placed firmly upon the shaft, and covered by a series of outer metallic rings.

Improved Resawing Machine.

John Gerhardt, Montreal, Canada, assignor to himself and James Hutchinson, of same place.—This is a simple self-contained gang resawing machine, which can be readily moved about and set up anywhere. It is self-sustaining, requiring no fixtures or fastenings other than its own supports, which consist of a strong horizontal frame of suitable hight, length, and breadth for a resawing machine, on which is the usual upright frame for the saw gate, also the driving machinery, and the feeding and regulating apparatus.

Improved Bench Vise.

Carloss Burton, New Baltimore, Ohio.—The stationary jaw of the vise is made angular to overlap a portion of the end and top of the bench. Upon the plate are cast arms, which are let into the top of the bench, and the ends of which are widened to give them a firm hold upon the said top. The movable jaw of the vise is placed in a horizontal position. To the rear part of the movable jaw are attached two rods, which pass through the stationary jaw, and which keep the movable jaw always parallel to the stationary jaw, or nearly so. The work, when long, is clamped between and held by dogs, one of which is inserted in a hole in the movable jaw, and the other is inserted in one or the other of the holes formed to receive it in the top of the bench.

Improved Railway Tie.

Samuel L. Porter and Duane Peck, Rochelle, Ill.—The bed pieces are of cast iron, with flat top part and flaring supporting sides, that rest upon the gravel, tamped firmly below them. The bed pieces are of equal size, forming a broad and solid base for the rails. Diagonally crossing braces connect the bed pieces across the track, and interlock with short side extensions of the bed pieces below the rails. Other devices secure the rigid and strong lateral connection of the bed pieces. The rails are secured on the flat top of the bed pieces by longitudinal guide flanges. This mode of fastening the rails, together with the rigid support of the bed pieces, prevents effectually the well known moving of the track in endwise direction for certain distance.

Improved Propelling Wheel for Canal Boats.

Gustav Heydrich, New Ulm, Minn.—This wheel is rotated in a central wheel box of the boat, and is provided with hollow sleeves that extend radially from the hub and guide sliding propelling arms. Said arms are released from the pressure of spring levers acting thereon, by an arc-shaped side flange of the wheel casing, so that they engage the bottom of the canal and propel the boat.

Improved Hair Cutters' Gage.

Alexander G. Wilkins, Meadville, Pa.—This invention consists of a slotted gage, composed of parallel ribs, which are bent of one piece to form a point, heel, and top part, the heel and point fitting the convexity of the head, while the curved or bent ribs guide the head and hold it in position for the cutting action of the shears supported on the upper or top part of the gage. The handle is attached to the rear ends of the ribs, and provided with adjusting devices, by which the ribs may be set nearer together or farther apart, for cutting the hair to any required length.

Improved Seed Planter.

John G. Garner, Pittsburgh, Texas.—In this seed planter, the dropping disks are mounted loosely on a driving axle, so as to be shifted thereon, and interchangeable hoppers are provided, adapted for one or both disks, respectively.

Improved Brick Kiln.

William Bull, Ewell, England.—The kiln may be of any continuous form. At the bottom of each wall, openings are left at intervals of three feet. The floor is built between the parallel walls of the kiln, and the openings are carried across the whole width through the flooring, and covered in with bricks. A few inches above each ash flue, a firing flue is left for the insertion of the fuel. The bricks to be burnt are set close together in walls, one brick's length in thickness, parallel to the kiln walls. Between the walls of green bricks and the kiln walls, spaces are left for draft passages. Opposite each firing flue an opening is left in the walls of green bricks, the whole taken together forming a combustion chamber for the fuel, which is inserted through the firing flues. These walls of green bricks are carried up to within about a foot of the top of the kiln. The whole is then covered over with a layer of bricks, flat, on which is spread a layer of ashes. At intervals of forty feet, a width of about eighteen inches of the brick flat is open, over which, when required, a movable chimney on wheels, extending the entire width of the kiln and with outlets, may be placed as an escape flue for the steam and waste products of combustion.

Improved Truss Bridge.

John B. Winters, Attica, Mich.—This invention consists, essentially, of plates and rods for coupling the stress and sway braces to the chords; also, plates for coupling the chords to the caps. The construction is very simple, and the arrangement of the plates allows of fitting in the braces with but little labor.

Improved Screw-Threading Device.

Charles W. Roberts, Cohoes, N. Y., assignor to Norman W. Frost, same place.—The vise plate is made adjustable on the bed. The lower jaw is stationary, and made in two parts, connected together. The upper jaw is fastened to the sliding block, which is attached to the vise screw. This jaw works down between the two parts of the lower jaw. Each of the jaws has a V-shaped opening, the sides of the V being serrated so as to effectually hold the tube within the angular openings, and keep it from turning. The hub of the die wheel works on a stationary screw block as the wheel is turned, and draws the dies on the tube. The tube is held stationary in the jaws of the vise, and the feed block is held stationary on the tube by a set screw. Suitable adjustment adapts the machine to different sized tubes.

Improved Lamp Burner.

John Gleason, Brooklyn, N. Y.—This invention has for its object to prevent the upper part of a lamp from being heated by the burner, and thus guard against explosion, and at the same time produce a better light. The invention consists in a safety extension collar, formed of the double walled body, having its outer wall finely perforated and a single hole in its inner wall. It is provided at its ends with collars to adapt it to be interposed between the burner and collar of a lamp. The hole in the inner wall of the extension collar also allows any explosive gas that may be formed in the lamp to escape, thus further guarding against explosions. It is made so as to go on all lamps, from the largest to the smallest, and is particularly adapted for gas fixtures, and intended to take the place of gas in stores, as any kind of illuminating oil or liquid gas can be burned with perfect safety, with or without chimneys. A sample burner will be forwarded on receipt of fifty cents, on application to the inventor, at 390 Hicks street, Brooklyn, N. Y.

Improved Garter.

Lucius F. McDonald, Belfast, Me.—A short piece of elastic webbing is looped around a metallic loop, and its ends are secured to each other and to a buckle by a metal plate, which is looped around the tongue bar of the buckle, and has a short slot for the passage of the tongue of said buckle. Around the metal ring is also passed a light sheet metal plate, the ends of which are bent together, and receive between them the end of the leather strap. Upon the side edges of the plate are formed lips, which are bent down upon the upper end of the said plate. The ends of the plate and the lips are pressed down upon the end of the strap, and are further secured in place by punching.

Improved Dumping Car.

John E. Bemis, Chicago, Ill.—The object of this invention is to so improve the platform dumping car which was patented to same inventor under date of May 5, 1874, that the mode of throwing the tilting platform in and out of gear with the trucks is simplified, and the dumping and discharging of the load facilitated. The motion of the cars, by means of a slight backing of the locomotive, tilts the platform and dumps the load on the same, in the manner set forth in the aforesaid patent. After the load is discharged the platform tilts back on the trucks, and is carried into regular position by the forward motion of the locomotive.

Improved Device for Filling Bags.

Junior D. Platt, Plattsville, Ill.—The stand is made adjustable by means of a screw clamp, to which it is attached, so as to be placed in any convenient position on the counter or shelf. A pivot pin in the lower end of the stand passes through the clamp, and allows the stand to be turned in either direction, as may be required. This stand is curved in its upper part, and its upper end has a flaring horizontal band, which receives and supports a funnel.

Improved Harrow and Planter.

Beauman Butler, St. Johnsbury Center, Vt.—The cross bars are armed with harrow teeth and cultivator or drill teeth, according to the kind of work to be done. There are also scraper bars, and a tongue roller extending across from one to the other of the runners. The front scraper is arranged vertically on pivots, and is armed with a metal plate at the front. There is also a foot lever, extending backward and resting on the first cross bar, to be pressed down by the driver to hold the scraper to its work, its office being to crush the clods and otherwise smooth the surface in advance of the teeth. The scraper may be used in rear of the harrow teeth, and provided with a suitably arranged lever for operating it. The hind scraper is a broad plank, armed with a metal plate, and arranged obliquely to the surface, the front edge being the highest, to run over and press down the lumps smoothly. It is also arranged on pivots at the upper edge to adjust the bearing portion higher or lower, as required, and it is provided with adjusting holders.

Improved Bird Cage Attachment.

George Fliedner, Portland, Oregon.—This is a crib for cages, for holding pieces of cake, apple, sugar, and the various articles which are usually placed between the wires of cages, and consequently not securely confined.

Improved Butter Worker.

Joseph Thompson, Albany, Wis.—In using the machine the butter to be worked is placed in the box between a grate and one of the followers. The cover is then closed, and a lever is operated, moving the followers back and forth through the box, and forcing the butter back and forth through the grate, working it thoroughly and bringing it to a uniform color in a very short time.

Improved Friction Drum.

Joseph S. Mundy, Newark, N. J.—This invention relates to improvements in friction drums for pile drivers and hoisting machines, and consists in the construction of the friction pulleys, and in the mechanism at the other end of the drum, by means of which the drum is made to take more or less friction, as may be required.

Improved King Bolt Bearing.

Gilbert J. Orr, New York city.—This is a bush in the axle hole for the king bolt, to take the wear to which the axle itself is subject without it, and be removed for the substitution of a new one when too much worn, to save the loss of the axle. It also consists of a nut for fastening the bush in the axle, and an inverted cup screwing on this nut to form a cup around the bolt above the axle, to contain absorbent material to be saturated with lubricating material.

Improved Toy Gun.

Wilhelm Wiedemann and Lewis Lindsey, Lawrence, Kan.—The barrel is formed of two parts, with a narrow open slit between them. The projectile is impelled by means of an elastic cord passed through the barrel, and its ends attached to a wire crosshead, which latter passes through the long slit. The wire crosshead also passes through a catch block, which, when drawn back, catches over the point of a tumbler, which latter is held in position by a trigger and spring. When the trigger is pulled the tumbler is released, the catch block slips from its end, and away goes the crosshead with the projectile before it.

Improved Fruit Picker.

Benjamin F. Price, Mount Sterling, Ill., assignor to himself and A. A. Hill, of same place.—The invention consists of jaws pivoted to each other, made the one with a double concave edge and the other with a single concave edge, and provided with rubber springs, in combination with a flexible tube, staff, and operating cord. The jaws can be drawn together to cut the stems of the fruit by pulling upon the said cord.

Improved Tag.

Cevedra B. Sheldon, New York city.—This invention consists in attaching the card to the twine by folding the corners of the card over the ends of the twine, at an obtuse angle to the parallel sides of the same, and fastening the said corners, with the inclosed ends of twine, with suitable adhesive matter.

Improved Shoe.

George D. Hill, Baltimore, Md.—The invention consists in first sewing together the ordinary in and out soles by a seam at the heel, and then sewing them, together with an extra insole, by an independent sole seam.

Improved Sash Fastener.

John Berndt, Denver, Col.—The invention relates to an upper and lower sash connected by a cord so as to be clamped and held at different elevations, and consists in bringing down the cord through a vertical hole in the top of the lower sash and partly through a munnion thereof, the pulley being arranged within a slot, and the clamp attached to the surface of the munnion.

Improved Curtain Fixture.

George C. Mathers, Louisville, Ky.—This invention relates to certain improvements in curtain fixtures, and it consists in the combination with a notched disk journaled in a slotted bearing, of a stationary detent, an endless cord, and two small friction wheels, the said wheels being arranged to one side of the disk, and the said cord passing around the same in such a manner as to form a laterally drawing loop, which, when a draft is exerted upon the cord, brings the disk away from the detent, and the journal of the disk in a portion of the slotted bearing where it is free to revolve.

Improved Wedge.

Charles McDermott, Oakland Station, Ark.—This invention is a wedge constructed with a chamber or cavity. The head and inclined sides of the wedge are formed, preferably, of a single plate of wrought metal, and the straight or parallel sides of triangular plates, the same being welded firmly together. The wedge is hence cheaper, lighter, and more convenient to handle or transport than the ordinary solid wedge. It may be also driven with greater ease, by reason of its inertia being more readily overcome by the blow of the maul.

Improved Wagon.

Jacob Becker, Jr., Seymour, Ind.—The invention consists in a very novel simple construction of wagon brake, whereby the holding back of the horses automatically applies the brake, while the tongue may be locked by a slide so as not to apply the brake. It also consists in a new mode of coupling the reach, in pivoting the doubletree, and in preventing the bolster from rocking.

Improved Wheel Plow.

Peterson Prawl and Francis H. Wemple, Waverly, Ill.—Both the transporting wheels run in the bottoms of furrows, so as to have smooth and level paths, and thus cause the plow to run true and steady. There is a pivoting connection between the axle and the beam, to enable the plow to be turned in smaller space than would otherwise be possible. The axle may be turned by turning an arm through the medium of a lever, to which is attached a lever pawl, the engaging end of which takes hold of the teeth in a curved bar. To move a small wheel down to support the machine in a level position while being turned, the pawl is released from the notched bar, and the lever is moved forward until the lower side of the small wheel is in the same horizontal plane with the lower side of the large wheel.

Improved Cotton Auger.

Albert O. Schultz, Memphis, Tenn.—This invention consists of a cotton auger with upper and tapering blade, and intermediate upward-inclined teeth, being provided with symmetrically fluted sides for reducing the cross section, and giving thinner and more pointed teeth and blades.

Improved Hand Fire Engine.

Henry Neumeyer, Millerstown, Pa.—This consists of a tank and three, more or less, single-acting force pumps combined so as to throw a single and continuous stream of water from a hose pipe. The cranks are so constructed that, while connected with the shaft, they may be slipped from the ends thereof and turned round into the tank, so as to be out of the way when they are not in use.

Improved Cotton Seed Planter.

Benjamin F. Miller and William J. Reeves, Gatesville, Tex., assignors of one half their right to James M. Morris and Edward A Jones.—The teeth are attached to a shaft which revolves in bearings in the sides of the hopper, in such positions that the teeth may project through a slot in the bottom of the hopper, so as to force the cotton seeds out through said slot. To a sliding rod within the hopperare attached one, two, or more crosspins, which keep the seed in the lower part of the hopper stirred up so that the teeth may carry it out, uniformly and without fail.

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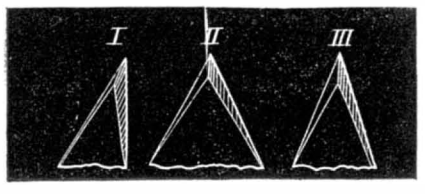
Notes & Queries

C. D. should consult a florist.—J. W. W. can find directions for making nitro-glycerin on p. 283, vol. 30.—C. G. will find full information as to grate bars in Trowbridge's "Heat and Steam Engines."—E. J. H. is informed that there is no rule for determining the horse power of a boiler.—Q. R. N. will find full information as to the rubber horse shoe on p. 166, vol. 31.—M. M. W. will find a recipe for baking powder on p. 123, vol. 31.—D. L. L. should consult a treatise on water wheels.—T. W. will find directions for hardening needles, etc., on p. 347, vol. 31.—I. C. F., W. R. M., and many others are informed that water glass is silicate of soda, advertised regularly in our columns.—J. L. S. can preserve his canvas tent by using the preparation described on p. 347, vol. 31.—B. C. S. can scour his castings by the process given on p. 139, vol. 31.

(1) W. H. B. asks: Will steam destroy the temper of spring steel kept constantly in it? A. The springs, if properly tempered, will continue serviceable for a long time unless the steam pressure is unusually high.

(2) F. L. asks: How much coal and water are needed to propel a freight train of 30 cars for 100 miles at the usual speed? A. These elements vary greatly. We find, from an inspection of locomotive returns, that a tun of coal will move an ordinary freight train a distance varying from 35 to 62 miles.

(3) S. F. S. asks: Can you tell me how to file a circular saw for sawing cord wood into stove length? A. No. 1 is a good shaped tooth for very soft wood, the wide bevel being the front of the tooth.



The point would be liable to break or bend in very hard wood or in knots. No. 2 will stand to saw the hardest timber or knots, but will not cut as easily as No. 1. No. 3 is a form of point generally used for promiscuous sawing of both hard and soft wood. The shapes of saw teeth should be varied to suit the kind of wood to be sawn. The set must be wide enough to clear the plate. In sawing very hard wood, less set is required than in sawing wood that is soft and fibrous.—J. E. E., of Pa.

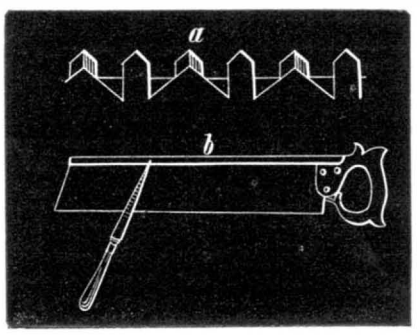
(4) B. M. M. and others ask: What study would be best for a machinist to take up? A. It would be well to begin with geometry, drawing, and natural philosophy. We can recommend Minifie's "Mechanical Drawing," Robinson's or Loomis' "Geometry," and Silliman's, Ganot's, or Deschanel's "Physics."

(5) F. E. H. says: I wish to make two large wooden troughs to hold a silver and copper solution, for electroplating. Please give me a recipe for varnish that will stand the cyanides. A. Coat it with marine glue.

(6) F. R. G. asks: I am engaged in constructing a reflecting telescope, which I wish to be a Gregorian. The mirror is 7 inches in diameter and of 6 feet focus. What should be the focus of the small mirror, and where along the tube should it be placed so as to give the best effect? A. Focus of small convex mirror, Cassegrain, 8 inches, 64 inches from speculum. A Cassegrainian would be much better. The small convex mirror corrects part of the spherical aberration of the speculum. It is placed at its own negative focal length inside the focus of the large mirror.

(7) W. L. W. asks: Is musk such as is used for perfumery, extracted from the common musk rat? A. It is prepared from the musk root, *sumbal*, or *jatamansi* (a substance imported from the East). The root itself has long been used in India and Persia as a medicine, a perfume, and for incense. It has a pleasant, musk-like odor, and acts as a powerful stimulant on the nervous system.

(8) A. W. R. asks: Can you give me any information as to the saw here shown? The engraving shows the shape of the fleam or lancet-toothed saw. *a* shows the form of tooth of full size, and *b*, the position for holding the saw. The saw is held flat on the bench, and one side is finished before the saw is turned over. No setting is needed, and the plate should be thin and of the best quality and temper. A. We have never used this particular shape of tooth. For very fine smooth sawing, this form of tooth would undoubtedly work well; but must be filed by an expert workman.—J. E. E., of Pa.



(9) S. M. asks: 1. How are galvanometers made? A. A magnetized needle is placed in the center of a coil of insulated copper wire, the needle being suspended by a thread, or resting on a pivot. 2. I have a magneto-electric machine for medical purposes. It has always worked well until lately, and now I cannot get a hard shock though I put on all the force I can. The induction coil is all right, but I can only get a very feeble current through the secondary coil, and that at very irregular intervals. It is driven by a revolving armature between the plates of a small electromagnet; the circuit is broken and connected by two small silver springs, which press upon an arrangement on the shaft of the armature. The armature revolves about 200 times per minute. A. Probably the coating or insulation of the wire of the secondary coil is destroyed, and thus prevents the secondary current from traversing the entire length of the wire.

(10) R. A. asks: How can I separate silver from copper in blocks of mixed metal? A. Dissolve the mixed metal in aquafortis of 1·2 gravity. Precipitate the silver as chloride with solution of salt, and reduce the chloride with zinc and dilute sulphuric acid. Evaporate the remainder (containing copper) to dryness, ignite to drive off the acid, and reduce the metal in crucible, or precipitate the copper in solution by iron.

(11) D. C. M. asks: Where can a mineral rod be obtained? A. If you mean by a mineral rod a divining rod, we cannot say, because they are only sold by quacks and used by ignorant persons.

(12) B. P. M. asks: When did the first land plants make their appearance? A. In certain shales and other deposits, belonging to the Devonian formation.

1. Is the school started by Agassiz still open, and is it the best school of its class? A. It is still open, and is the best. For further information, address the officers. 2. Do medical colleges admit students who only take anatomy? A. Not as a general rule.

(13) W. D. S. asks: 1. What substance will dissolve in water at its natural temperature? A. Most of the salts of the alkalies and metals. 2. What substance will dissolve in water only when heated to 200° or 212° Fah.? What substance will dissolve in water heated (under pressure) to 500° or 700° Fah.? A. Substances which dissolve under these circumstances will also dissolve, although not to so great an extent, at lower temperatures.

I drop a piece of copper into nitric acid; powerful analytic and synthetic action ensues, and there rises a murky, yellowish, brown vapor. What is this vapor? A. Hyponitric acid.

(14) A. S. asks: What degree of heat is required to melt nickel? A. Nickel has remarkable magnetic properties, which it loses on being heated to 650° Fah. The standard authorities do not state the melting point of nickel further than it is very high and near that of iron.

(15) F. E. asks: How can I line a tin can with lead? A. Tin lined lead pipes are now common, and a compound sheet of the two metals might be used for your purpose.

(16) T. H. W. asks: 1. How can I coat castings with copper? A. The article should first be rendered free from rust by rubbing with an emery cloth, or by dipping into a pickle composed of sulphuric acid 2 ozs., hydrochloric acid 1 oz., water 1 gallon. After the article has remained some time in this pickle, it should be taken out and the rust removed by a brush and some wet sand; if the oxide cannot be easily cleaned off, it must be returned to the pickle. As soon as the article is rendered bright, it is washed in a warm solution of soda or potash, for the purpose of removing all grease. Lastly it is well rinsed in hot water, and immediately placed in a concentrated solution of sulphate of copper, to which a little sulphuric acid has been added. In a short time it will be found to be coated with an even covering of metallic copper. 3. How can I blue wire cloth, such as is used for dish covers? A. See p. 266, vol. 30.

(17) W. R. asks: 1. Can you give me a recipe for a dye that will change a set of wooden white chessmen to a pretty red color? A. To 2 lbs. genuine Brazil dust add 4 gallons water. Place the articles, immersed in this liquid, in a suitable vessel, boil them for three hours and let them cool, then add 2 ozs. each of alum and aquafortis, and keep lukewarm until the required shade is obtained. 2. What would be the greatest distance at which a brilliant light would appear to stand over and so designate a particular house? A. We do not fully understand your question. The magnesium light has been distinctly seen at sea, when 25 miles distant, and the lime, "Drummond," or "calcium," light at a distance of fully 100 miles.

(18) H. M. asks: Can you tell me of a varnish which is perfectly transparent, for polished silver ware? A. We think the following recipe will answer your purpose. Take gum mastic 6 ozs., turpentine 14 ozs., place them together in a large bottle, and shake for some time without the application of heat. When dissolved, strain it through a piece of calico, and place it, in a bottle tightly corked, so that the sun may strike it for several weeks, which will cause a mucilaginous precipitate, leaving the remainder as transparent as water. It may then be decanted into another bottle, and put by for use.

(19) H. W. J. says: I have a camera obscura, but the lenses are gone. It will take a picture about 3 inches square. What kind of lens would be best to get? A. Try a meniscus, 1 inch in diameter, of 5 inches focus, or buy a quarter size view tube.

(20) E. B. I. asks: 1. How can I make paraboloid chucks to grind glass specula by means of a common lathe? A. Keep the mirror spherical until polished, then polish out the center until the focus of marginal and center rays is the same when you read the SCIENTIFIC AMERICAN at 50 yards distance. 2. If cast, how are the molds constructed? A. Cast a pair, tap for lathe spindle, turn to template of correct radius, then grind together with emery. 3. After the speculum is ground and polished, how can it be tested for minute errors, and how can such errors be corrected? A. The parabolic mirror has twice the longitudinal aberration of the spherical one. That of the spherical one is equal to the square of half the aperture divided by eight times the principal focal length. The mirror is mounted on wooden cleats and viewed at the center of curvature: 1, with an eyepiece mounted on a graduated table close to an artificial star, a lamp with two pinholes in its opaque screen. If spherical, the image is sharply defined, and surrounded by interference rings. 2. By moving an opaque screen across the cone of rays in front of the pupil of the eye. If the mirror be spherical, it will resemble a plane surface.

(21) H. Z. E. asks: 1. Does the earth in its path round the sun always move in the same plane? A. No. 2. What is the shape of the earth's orbit? A. An ellipse. The eccentricity is $\frac{1}{60}$. In 24,000 years it will diminish to 0·0033 and commence to increase.

(22) D. B. & D. H. B. say: We have an engineer running our engine; he sometimes runs with 30 lbs. of pressure, at other times as high as 75 or 80 lbs. He contends that low pressure is as good as high pressure in regard to economy. We say that low pressure takes more fuel, more water, and more steam. Which is right? A. The difference is in general considerably in favor of high pressure, but not always, however. We could not give an estimate of the difference in your case without knowing more particulars.

(23) E. O. G. says: 1. I state that, at the depth of 1 mile in the sea, a human body will, by the pressure, be rendered unrecognizable, at 3 miles torn and pressed out of shape, and at 7 miles torn to pieces. Am I correct? A. We do not know. 2. At what depth is there a pressure of a thousand atmospheres? A. At about 34,000 feet.

(24) N. R. says: I have a well 80 feet deep, which is 15 feet from boiler. Can I force the water up through pipe, 90 feet high from bottom of well, with 70 lbs. steam? A. Yes.

(25) P. P. says: I read that, in warming buildings by steam pipes, each square foot of surface will heat 200 cubic feet of the surrounding air to 75°, and will require 170 cubic inches of boiler capacity for its supply. 1. Is this a good standard to go by in estimating the quantity of pipe needed to heat a building? A. There is no general rule for all kinds of buildings. 2. What increases and diminishes the weight of air, and what increases and diminishes the density of air? A. Cold or compression increases the weight of a given volume. Heat or expansion diminishes it.

(26) J. H. says: 1. We have a boat 16 feet long by 3 feet wide, flat-bottomed, pointed at bow and nearly so at stern. Can this boat be driven as fast by a propeller as by one pair of oars? A. The oars will answer best. 2. On p. 43, vol. 32, in your answer to J. H., you speak of pitch and gutta percha not being attacked by water. Would this be good for painting the outside of a boat with, to prevent the water soaking into the wood? A. Yes.

(27) A. B. asks: What is meant by the area of a piston? A. The number of units of square measure, such as square inches or square feet, in the cross section.

I have a rose bush that seems to be full of small reptiles resembling snakes. How can I kill them without killing the rosebush? A. Apply to a nurseryman.

What is meant by the frogling box of a locomotive? A. The term is new to us. Perhaps some of our readers can explain it.

(28) A. L. M. asks: What is the best plan of seasoning green dogwood or other small woods to avoid cracking? We are putting it in a tight box and turning on live steam, and intend piling it in a dry room (heated by steam) afterwards. Will this answer, and how soon will it dry? A. No doubt this plan will answer if it is thoroughly steamed, and it will dry in a few days.

1. What should be the size of a crank pin for a 45 horse power engine? A. The question is too indefinite to admit of a general answer. 2. How can I tighten a loose crank on shaft? A. It should be bushed and refitted.

(29) L. A. T. says: 1. On p. 19, vol. 32, under head of "British Naval Guns," we find the following: "The latter was proved capable of penetrating wrought iron plates 14 inches thick, as well as a backing of 18 inches of timber and a skin

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of 1¼ inches plates," etc. We wish to know if the projectile will pierce the above mentioned in one body? In other words, will it (the gun) shoot through a total of 33¼ inches of the above at one shot? A. Yes. 2. Can a ball be made to go through 14 inches of solid iron? A. Yes. 3. Can a vessel be made to float on water with that amount of iron on it? A. Yes. 4. "It penetrated 12 inches armor." What is meant by armor? A. The plating on the vessel's side.

(30) L. H. H. asks: What can I use on belts that have become glazed and hard? A. We believe castor oil and neatsfoot oil to be among the best preparations. We know, however, that engineers have a variety of materials which they think very well of; and as the matter is one of interest, we ask for information from our readers.

(31) C. E. P. asks: Please give me a good practical recipe for coloring raw wool with a logwood blue. A. Use 10½ lbs. logwood, 1¼ lbs. prussiate of potash, 3½ lbs. supersulphate of tartar, 2¼ quarts muriatic acid, 1¼ lbs. nitric acid, 1¾ lbs. muriate of tin.

With an engine 9x18, how can I get the most power with 50 lbs. steam, with a 4 feet band wheel on engine shaft and a large belt to drive line shaft with, or by coupling the line shaft to the engine shaft and drive each machine with a small belt from a pulley on line shaft? A. In the second way.

(32) F. H. H. asks: 1. Can oil or grease be extracted from bones, leather, etc., by the use of bisulphide of carbon? A. Yes. It is used in large quantities for this purpose. 2. How can the grease be recovered or separated from the carbon? A. By distillation, using a retort connected with a worm, and condensing tanks, similar in arrangement to the apparatus used in the distillation of light oils.

(33) C. C. asks: How can I construct a furnace to smelt copper and silver ore on a small scale? A. It would require a whole treatise to give you the desired information, and we advise you to consult standard works on the subject, if the services of a practical man cannot be obtained.

(34) C. F. says: I wish to condense about 7 cubic feet oxygen into a cylinder 7 inches in diameter and 18 inches long, and about 10 feet hydrogen into one of the same size. What will the pressure per square inch be on each cylinder? A. The pressure will vary inversely as the volume. Thus, if 10 cubic feet of hydrogen, at a pressure of 15 lbs. per square inch, are compressed so as only to occupy a space of 1 cubic foot, the pressure will be 150 lbs. per square inch. Iron $\frac{1}{10}$ of an inch in thickness will answer for the cylinders. You will find rules relating to gases in Ganot's or Deschanel's "Physics."

(35) E. H. M. asks: What would be the best packing to use in a cooking vessel to prevent the escape of steam? A. It would probably be well to give the cooker such a form that you can get in a packing ring, and clamp the two parts together.

(36) J. M. T. asks: At what speed will an engine 5x6 and a boiler 5 feet high x 36 inches in diameter, with 70 lbs. of steam, drive a propeller screw 36 inches in diameter in a tank of water, the wheel to be stationary? A. At about 300 revolutions a minute, if the wheel were completely immersed.

How high will a pound of steam raise a column of mercury? A. About $2\frac{4}{100}$ inches.

1. Is there any back pressure on a high pressure cylinder of a compound engine? A. Yes. 2. Are the cranks of such an engine set at right angles or opposite each other? A. In both ways, and at intermediate angles. 3. Would a three-cylinder engine on the compound principle, having cylinders for three pressures from high to low, be practicable? A. Yes. It has been done.

(37) G. S. asks: The diameter and length of a hydraulic cylinder being given, how can I find the thickness of metal to withstand any pressure per square inch? A. It is customary to strengthen such cylinders with bands or other devices, when the pressure is very great. But for an ordinary thick cylinder, made of cast iron, the following rule will answer: Safe strain in lbs. per square inch

$$= \frac{4{,}000 \times \text{thickness of cylinder in inches.}}{\text{internal radius in inches} + \text{thickness in inches.}}$$

(38) A. B. asks: What is the milk of lime that distillers use for cleaning vats, etc.? A. Cream or milk of lime is a thick mixture of the hydrate of lime with water. It is readily obtained by first slacking the lime properly, and then mixing it with water until of the consistence of thin whitewash.

(39) J. L. asks: What is the difference in strength of a 14 inch and 16 inch boiler flue against external pressure? What is the variation of inches in diameter to base calculation on, for external and internal pressure, or how much additional thickness of iron would be required to make strength equal for both kinds of pressure? A. The following empirical rule will enable you to make the desired calculation: The resistance to collapse, in lbs. per square inch of surface, is found by multiplying the square of the thickness in inches by 806,000, and dividing the product by the product of the diameter of the flue in inches and the length in feet. Let F=thickness of flue in inches, D=diameter of flue in inches, L=length of flue in feet, P=resistance of flue to collapse, in lbs. per square inch. Then $P = \frac{806{,}000 \times T^2}{D \times L}$

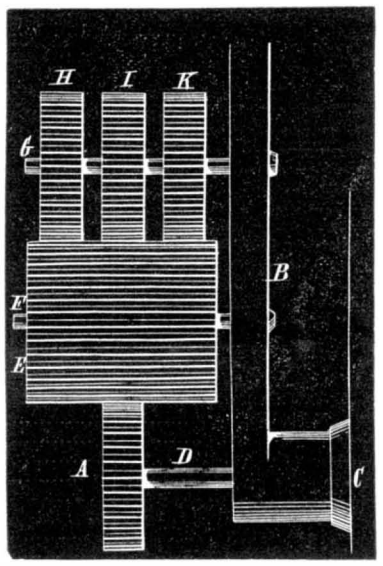
(40) W. K., of Lippe, Germany, says: Since discovering that the following method of hardening picks for burr stones was the best, I brought it into use at several places, and all the millers who use it will have no other method: Have the pick made of the best tool steel, with a stout edge to it, both sides being similarly shaped; let the tool be about one inch and a half wide. Heat the edge to a cherry red and dip it into clear, cool water, not further than one tenth of an inch. In doing this, let your arm rest on something firm, to enable you to hold it quite steadily. As soon as the tool is sufficiently cooled off, it is ready for use. The advantage of this method is that you obtain a hard edge, not liable to fracture, as it is sustained by the soft steel behind it.

(41) H. P. asks: How can monograms, etc., be erased from china ware? Will hydrofluoric acid do it, without making a spot? A. Stop out the part of the vessel which you do not wish to have attacked with a dam of wax or melted paraffin, and allow the liquid hydrofluoric acid to remain in contact until the surface is sufficiently attacked. But it would be a very troublesome and difficult operation. There is no other solvent so powerful as this.

(42) L. G. S. asks: Can you tell me what solution or preparation is used for dipping plain wooden crosses in, so that they are covered with crystals that are generally red and not more than ⅛ inch in diameter and ¼ inch long? A. Try coloring a saturated solution of saltpeter or alum with aniline red, and continue dipping until a sufficient thickness has crystallized. Or use a solution of bichromate of potash or red prussiate of potash.

(43) J. S. F. asks: Is there any such an art as throwing the voice? Several persons have told me that ventriloquists can throw their voices in any direction, and at any desired distance. I contend that it is mostly deception, for it does not look reasonable to me that sound can be pitched about, separate from the body. A. Your view of the matter is correct. The deception consists in so working upon the imagination that an audience readily believes the sound to come from a distance.

(44) J. L. D. says: There is a curious combination of gear wheels called Ferguson's mechanical paradox. It consisted of 3 pinions connected to one spur wheel, one of which runs in opposite direction to the spur, one in the same direction, and one not at all. How can this be? A. The



wheel, A, is secured to the pin, D, about which the arm, B, revolves. There are two pins, F, G, secured to the arm. The wheel, E, is loose upon F, and gears with A. The three pinions, H, I, K, are loose upon the pin, G. I has as many teeth as A; H, one more, and K, one less.

(45) C. W. J. asks: What is Burnetized lumber for building purposes? A. Lumber treated with Burnett's disinfecting fluid, which is largely used as an antiseptic; and this fluid is a solution of chloride of zinc.

1. What is the fertilizing principle of cotton seed? A. It is probably due to the potash contained in the seed. 2. Would not the seed of the castor oil plant answer as well? A. That must be, of necessity, a matter of experiment with you; we know of no recorded comparisons between the two.

How can I make red and green ink for ruling? A. Red ink: Digest powdered cochineal 16 parts, oxalic acid 2 parts, dilute acetic acid 80 parts, distilled water 40 parts, for 36 hours; then add powdered alum 1 part, gum arabic 1 to 10; shake up, let stand for 12 hours, and strain. Green ink: To powdered bichromate of potassa 8 parts, contained in a porcelain dish, add oil of vitriol 8 parts, previously diluted with 64 parts water; then heat, and, while evaporating, add gradually 24 parts of alcohol, and reduce to 56 parts, which filter, and in the clear liquor dissolve 8 parts of gum arabic.

(46) J. L. W. says: You say: "Never allow drinking water to be drawn from a cistern supplying a water closet." Why not? A. Because the cistern is often so connected with the water closet that there is danger of the gases passing from one into the other, or the water, which readily absorbs noxious gases and vapors, becomes impregnated with them.

(47) E. L. asks: Of what is carbolate of iodine inhalant made? A. The mono- and di-odated compounds of phenol are produced, with copious evolution of hydrochloric acid, by the action of chloride of iodine on phenol. The solution of the residue in soda ley yields, on addition of hydrochloric acid, a grayish white, viscid body, which, when heated under the ordinary atmospheric pressure, is resolved into a large quantity of iodine and rosolic acid; but when distilled in a vacuum, it yields liquid mono- and di-iodophenol, containing a small quantity of rosolic acid. Mono-iodophenol, C_6H_5IO, is a colorless, sirupy liquid, insoluble in water, soluble in alcohol and ether; and it forms, with alkalies, crystalizable salts which are soluble in pure water, but insoluble in strong potash ley. Di-iodophenol, $C_6H_4I_2O$, is a colorless solid, which melts at about 110°, dissolves sparingly in water, and crystallizes from hot dilute alcohol in slender flattened needles. It dissolves in alcohol and ether, and in alkalies, forming with the latter compounds which are soluble in water but insoluble in strong potash ley. When heated it gives off iodine, and leaves rosolic acid.

Why is it that the dead are always buried with the head to the west? A. Are they?

I have a microscope and telescope, both of which are achromatic; the object glass of the latter is 2⅘ inches in diameter, its focal length about 54 inches. Is there any way by which I can combine the lenses of the microscope and use them for an eyepiece in the telescope to increase the power of the latter? A. No.

What would be the effect of black pepper sprinkled upon beef or pork when packing it for winter and summer use? A. It would probably be of no advantage.

What effect would saleratus or bicarbonate of potash have, if added to the brine in packing either beef or pork? A. It would alter the taste, and would not prevent spoiling.

What is paraffin? A. It is a white solid, contained in the heavy portion of mineral oils.

(48) M. W. H. asks: Is cherry tree gum of any value for mucilage? A. We do not find it mentioned as of any value. A good mucilage is the following: Dissolve clear gum arabic in hot water, and add a very small quantity of sulphate of quinine. The latter effectually prevents the mucilage from becoming moldy, and replaces the poisonous creosote, corrosive sublimate, etc., frequently used to remedy this evil.

Are there any lead mines that have no silver in the ore? A. The galena, or sulphuret of lead, which is the ore usually mined, always contains a small percentage of silver.

What is the value of pure gold per ounce? A. Pure gold is worth about $30 an ounce.

(49) J. S. says: 1. I have a well, the water in which is hard, and there is a chain pump in it, the chain being covered with zinc. Is it unhealthy to use the water? A. Generally speaking, no. 2. How does zinc poison affect the system? Does it ever injure the eyesight in any way? A. The salts of zinc, when taken in poisonous doses, cause violent vomiting, burning pain in the stomach, dull eyes, fluttering pulse, and cold extremities. Death seldom ensues, in consequence of the emetic effects.

(50) D. D. N. says: We found that our lamp burnt with a low flame for about 10 minutes, when suddenly the flame would dart up to about 15 inches in hight. The oil would trickle down, and the blaze descend below the chimney holder. What was the matter with it? A. Your trouble was probably due to the use of too light an oil, the vapor of which soon partially filled the inner chamber, and, owing to the warmth of the room, expanded and caused the overflow. In this case the remedy is to use an oil of a greater specific gravity.

(51) L. K. L. asks: 1. Which flame is best for a blowpipe to solder white metal to white metal, gas or alcohol? A. Either will do. 2. How can I make a white metal solder? A. You will find a recipe on p. 123, vol. 32.

(52) J. A. D. asks: What acid or combination of acids will separate the cotton and the wool in a mixed fabric? A. A solution of ammoniacal oxide of copper in excess of ammonia dissolves cotton, but not wool. To remove the wool from the cotton, steep in a concentrated solution of potash, when the wool is absorbed, leaving the cotton.

(53) A. F. asks: 1. Will boiling or steaming timber injure its solidity? A. The pores of the wood will become filled with liquid, and some of the substances soluble in water will be extracted. 2. Are there any chemicals that will improve it? A. It is sometimes treated with chloride of zinc, or chloride of mercury, or tungstate of soda.

(54) J. H. says: I wish to make a light garden hose out of cotton drill or cotton duck, by using two thicknesses of the materials. What kind of cement, that is insoluble in water, can I use to stick the two layers of cloth together? A. Dissolve india rubber in bisulphide of carbon, or in hot benzine.

(55) L. S. asks: What cement is used for cementing tea lead to paper by the Japanese? A. Generally what is known as rice glue. It is made by intimately mixing rice flour with cold water, and then gently boiling it; it is beautifully white, and dries almost transparent. Papers pasted together with this cement will sooner separate in their own substance than at the joining.

(56) H. S. M. asks: What is the shortest, surest, and best way to analyze water? A. Water analyses are difficult, and can be made only by chemists. 2. What is the best way to find if the water we wish to analyze is fit for drinking? A. As a general rule, when a bottle is half filled with the water to be examined, set aside in a warm place, and after a few days (on opening the bottle) is found to have a bad smell, taste, and color, it is not wholesome.

Has oxygen been found to be a compound, as was reported lately? A. No.

What is the latest system of symbols in chemistry, and what is taken for the unit? A. The weight of the hydrogen atom is the unit. The system is described in Cooke's "Chemical Physics."

(57) T. F. R. asks: What is it that causes the phenomena which we see after a person has imbibed drink of any kind that will intoxicate? A. "The effects of ardent spirits may be divided into three stages. First, excitement of the vascular and nervous systems. The pulse is increased, the face flushed, the eyes animated and perhaps red. the intellectual functions are powerfully excited the individual is more disposed to joy and pleasure, cares disappear, the ideas flow more easily and are more brilliant. Second, intoxication or drunkenness, which is a disordered condition of the intellectual functions and volition, manifested by delirium, varying in its character in different individuals, and by an incapability of governing the action of the voluntary muscles. This state is accompanied with excitement of the vascular system, and frequently with nausea and vomiting; it is followed by an irresistible desire for sleep, which usually continues for several hours, and is attended with copious perspiration. When the patient awakes he complains of headache, loathing of food, great thirst, and lassitude; the tongue is furred, and the mouth clammy. Third, coma or true apoplexy, which is usually observed when excessive quantities of spirit have been swallowed in a short time. The pulse is generally slow, the pupils are usually dilated, and the breathing is for the most part slow; but exceptions exist to all of these statements. In some cases actual apoplexy (with or without sanguineous extravasation) is brought on. The immediate cause of death appears to be either paralysis of the muscles of respiration, or closure of the glottis. The effects of spirit agree, in a considerable number of circumstances, with those of wine, but present some peculiarities. Spirit more readily induces excitement, which, however, is of shorter duration, being more rapidly followed by collapse, relaxation, or debility. Death is by no means an unfrequent consequence of deep intoxication from spirit."—*Pereira.*

(58) W. H. S. asks: 1. How can I cast plaster of Paris molds without getting airholes in them? A. Make your plaster of the consistence of thick cream. For hardness, use a strong solution of alum, instead of pure water. 2. What kind of varnish should I use for a child's carriage? A. Copal. 3. What is a good varnish for plaster of Paris patterns, to fill up the pores? A. Try paraffin varnish.

(59) W. M. says: You recently published a recipe for coloring hair dark brown. I tried it according to directions, and all it did was to leave a reddish brown deposit on the hair, which brushed off as soon as dry. What is the matter? A. You probably did not remove all the oil or grease from the hair. It is to be observed that hair dyes of all kinds will only act effectively and satisfactorily on perfectly clean hair. The presence of the slightest contamination of oily or greasy matter will arrest or greatly lessen their action, and render it unequal in different parts. Hence the hair, in all cases, should be first thoroughly washed with warm soap and water, then rinsed with tepid water, and lastly wiped dry, previous to their application. A few grains of soda or salts of tartar, added to the first water, will facilitate its detergent action.

(60) R. D. asks: 1. What acids or fluids, mixed with hydrofluoric acid, will etch a clear ground on glass? A. Did you use a solution of hydrofluoric acid or hydrofluoric acid gas? 2. How can I prepare what is termed by etchers white acid? A. We do not know of any acid by this name. 3. What acid or mixture of acids, applied to glass and covered with felspar, will produce a frosted appearance? A. Sulphuric acid. The better method is to place fluor spar or felspar in a shallow leaden dish, and cover it with sulphuric acid. The glass plate may be placed to cover the pan, and as the hydrofluoric acid gas is generated it will attack the under side of the glass plate. 4. What clear varnish is used by sign painters as a finishing protection to gilding on glass? A. This is prepared by dissolving in boiled linseed oil an equal weight of either copal or amber. This is to be diluted to the proper consistence with turpentine.

(61) J. E. S. says: In your last issue you gave the following formula for imitation gold 100 parts copper, 7 parts tin, 3 parts magnesia, 3·6 parts sal ammoniac, 1·8 parts quicklime, and 9 parts bitartrate of potassa. Of what use is the magnesia in this? A. The recipe was originally published by two French authors, MM. Mourier and Vallent, who claimed for it the advantages mentioned, but did not state their reasons for adding the magnesia, which would not seem essential.

(62) M. M. M. asks: Are trichinæ found in the fat or lean meat of the hog? A. In both, and principally in the muscles.

(63) W. Y. asks: Can the nerves of the teeth be killed? A. Yes. The employment of arsenious acid for the purpose originated with Dr. Spooner, of Montreal. "The use of the actual cautery may be often successful; but inasmuch as it almost always produces inflammation in the investing and alveolar membranes, it should never be recommended. Nitrate of silver seldom succeeds, and usually increases the pain. The employment of arsenic, if applied directly to the nerve, will always succeed. The pain, it is true, will be removed by the destruction of the nerve; but so great a portion of the vitality of the tooth is at the same time destroyed that the organ is apt, sooner or later, to become a source of irritation to the surrounding parts. The propriety, therefore, of the employment of remedies of any kind for this purpose, except to a front tooth, may be looked upon as exceedingly questionable. It is true, the vascular and nervous connection kept up between the investing membrane and the outer surface of the root may, for a time, and more especially if it be an incisor or cuspidatus, prevent it from exerting any marked injurious effect; but in the majority of cases, the vitality even here is so much weakened as, eventually, to render it productive of more or less irritation. The effect of arsenic cannot always be confined to the lining membrane; it often extends to the investing, and for this reason I regard the immediate extirpation of the pulp with an instrument, if the tooth have but one root, as by far the preferable method of treatment. But this operation cannot always be performed with certainty of success on a molaris or bicuspis."—*Harris*

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(64) J. M. says, on the question of size of pump pipes: I put the air vessel or water chamber on to the suction pipe to the pump,as suggested by N. E. L; and while the speed of the pump could be increased somewhat, the results were not near as good as prophesied by N. E. L. I am now convinced that, where elbows or bends are used in the supply pipe to a pump, the diameter of the pipe should be much increased: this applies also to long pipes, and if the manufacturers of pumps would make their machines to receive pipes equal to the diameter of the pump cylinder, much better results would be obtained than are now accomplished. I am now putting up a pump exactly like the pump that I originally asked you about. The opening in pump is for a pipe six inches in diameter; but I intend to use a pipe eight inches in diameter to a point as near the pump as possible, and expect thereby to be able to run the pump faster and show better results than I have been able to with the pump on which I used the six inch pipe for the whole distance. My experience shows that it is not safe to be governed closely by the rules set down in the books on hydraulics. As no allowance is made for rough and uneven places found in almost all pipes, which retard the flow of water much more than is generally imagined, the only sure way that I know of is to use pipes large enough to furnish sufficient supply. In testing a fire pump recently, I found that the lining in a rubber-lined hose was torn in a few places, and hindered the flow of water so much that the power of the pump was diminished fully one quarter. The chamber of which N. E. L. speaks, on the suction pipe to a pump, is of much less use on a pump which takes in water at both strokes of the plunger or piston than on a single acting pump, as in the latter case this chamber has a chance to fill while the pump is making one stroke. [If this writer errs at all, it is certainly on the safe side.—EDS.]

(65) S. N. M. says, in reply to F. D. N., who asks: What is the rule by which paper can be cut so as to cover a globe? A globe can be covered with spindle-shaped slips, each in length equal to half the circumference, laid from pole to pole; the narrower the slips the more neatly they will fit, say 10° wide at the center. Calculate the linear width. Draw a straight line equal to ½ the linear circumference, and bisect it. Through the center point draw a perpendicular indefinitely on each side. Take points on this perpendicular, each side at a distance from the central point, equal to ½ the linear width of the slips. Through these two points and the ends of the first line, draw arcs of a circle. The figure thus drawn is the exact pattern of the required slips. To find the diameter of the circle on which these arcs are to be drawn, divide the square of ¼ the circumference of the globe by ½ the linear width of the slips; add the quotient to the divisor, and the sum will be the required diameter. Example.—Let the diameter of the globe be 12 inches; its ½ circumference will be 18·849 inches. Let the slips be 10°, and their linear width will be 1·047 inches. The diameter of the required circle will be 14 feet, 2·17 inches; radius 7 feet, 1·08 inches. In practice, take a rod for a radius, with an awl for a center pivot, and a small sharp-pointed knife at the other end to cut out the slips.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

J. E.—It is litharge or the oxide of lead, and is formed whenever melted lead comes in contact with the oxygen of the air. It can be reduced to metal again. Argentiferous galena is sulphuret of lead containing a small percentage of silver.—E. P. C.—It is quartz, and has no especial value.—W. McC.—No. 1 is a calcareous earth, containing the remnants of fossil shells and a small amount of organic matter. On certain kinds of land, it might be used with benefit. No. 2 is clay and earth impregnated with bitumen, which could be obtained by proper treatment, and used for heating and illuminating purposes.—R. T. P.—They are earthy magnesian limestones, one of them containing a considerable percentage of bituminous matter; another is colored by a green earth.—O. S.—The brilliant metallic particles are pyrites, not gold, of which there are no external indications; although it is possible that, if the rock were properly crushed and assayed, it might be found to be auriferous.—S. W.—It is fluoride of calcium, or fluorspar. It fuses readily in a blowpipe flame, and is faintly fluorescent. Its specific gravity is 3·05. By further search, you will probably find well formed cubical crystals, of which we should be glad to have specimens.—W. S. V.—Send pieces large enough, and we will determine them. These fragments are too minute.

H. L. N. asks: How can I clean a knife from rust formed by perspiration, so as to make the knife look as though it had just come from the works?—W. H. B. asks: From what point does steam press equally in all directions? Does it not press equally in all directions from a certain center? Is not that center the mathematical center of the vessel in which it is, of whatever shape the vessel may be?

COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges, with much pleasure, the receipt of original papers and contributions upon the following subjects:

On Steam Boiler Explosions. By M.
On Honing Razors. By G. W. D.
On Exhaust Steam. By J. F. S.
On Combustion. By C. W.
On Ants. By H. L. A. C.
On a Calculating Machine. By E. K. W.
On a Phenomenon Explained. By A. S. H.
On the Transit of Venus. By D. W. de F.
On Flying Machines. By A. B. B.
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On a Man-Eating Tree. By F. H. H.
On Finding Lost Property. By H. W. S.
On Shifting Passengers from Cars. By B. F. L.
On the Occult Sciences. By J. B.
On Amalgam Fillings. By F. H. H.
On the Sewing Machine Monopoly. By L. M. H.
On Mathematical Facts. By M. P.
On Boulders. By D. B.

Also enquiries and answers from the following:

R. L. R.—A. B. H.—W. S.—D. M.—A. W.—J. H. S.—A. B. C.—J. H. H.—J. R. S.—H.—R. L.—W. L.—E. H.—W. H. H.—S. L. F.—A. O. C.

HINTS TO CORRESPONDENTS.

Correspondents whose inquries fail to appear should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them. The address of the writer should always be given.

Enquiries relating to patents, or to the patentability of inventions, assignments, etc., will not be published here. All such questions, when initials only are given, are thrown into the waste basket, as it would fill half of our paper to print them all; but we generally take pleasure in answering briefly by mail, if the writer's address is given.

Hundreds of enquiries analogous to the following are sent: "Who makes picture frame mitering machines? Who makes engineers' and surveyor's instruments? Who publishes a book containing a list of all the mines in the United States? Who buys black walnut knots, etc.?" All such personal enquiries are printed, as will be observed, in the column of "Business and Personal," which is specially set apart for that purpose, subject to the charge mentioned at the head of that column. Almost any desired information can in this way be expeditiously obtained.

[OFFICIAL.]

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EXTENSIONS GRANTED.

31,030.—SAUSAGE STUFFER.—A. Nittinger.
31,082.—MIXING DOUGH.—W. Hotine.
31,094.—CREASING STRAPS, ETC.—W. McK. Thornton.
31,102.—CAR SPRING.—T. F. Allyn.
31,128.—HOIST.—E. G. Otis. Three patents.
31,133.—CULTIVATORS.—D. S. Stafford.

DISCLAIMERS FILED.

31,133.—CULTIVATOR.—E. T. Conklin.
37,991.—ROLLING LEATHER.—J. Whitney.

DESIGNS PATENTED.

8,036.—SCREW HEADS.—J. S. Ray, East Haddam, Conn.
8,037 & 8,038.—SCREW HEADS.—R. H. Burr, West Meriden, Conn.
8,039.—HANDLE SOCKETS.—R. H. Burr, West Meriden, Ct.
8,040.—GRAVE COVERINGS.—I. G. Lunday *et al.*, Hickory Flat, Ala.
8,041.—LAMP BRACKET.—F. R. Seidensticker, West Meriden, Conn.
8,042 & 8,043.—CHANDELIERS.—F. R. Seidensticker, West Meriden, Conn.
8,044.—COOK STOVE.—G. A. Wells, Troy, N. Y.

TRADE MARKS REGISTERED.

2,197.—CIGARS.—Ch. H. Brenaman & Co., Baltimore, Md
2,198.—TEA.—R. Cunningham, San Francisco, Cal.
2,199.—CIGARS.—Feldman *et al.*, Allentown, Pa.
2,200.—WHISKIES.—O. Jackson & Brother, N. Y. city.
2,201.—CIGARS.—M. Stachelberg & Co., New York city.
2,202 & 2,203.—TEAS.—Williams & Co., San Francisco, Cal.
2,204.—COTTON CASSIMERES.—Bliss *et al.*, N. Y. city.
2,205.—CIGARS.—F. Dittmer, Detroit, Mich.
2,206.—STARCH.—C. Gilbert, Buffalo, N. Y.
2,207.—BITTERS.—Schmidlapp & Co., Cincinnati, Ohio.
2,208.—CIGARS.—Seidenberg & Co., Key West, Fla.
2,209.—CIGARS, ETC.—Consol. Tobacco Co., Gilroy, Cal.
2,210.—SILVER PLATED GOODS.—J. W. Tufts, Medford, Ms.
2,211.—WIRE GOODS.—J. H. & N. A. Williams, Utica, N. Y.
2,212.—MEDICINE.—J. E. Woodward, Boston, Mass.

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CANADIAN PATENTS.

LIST OF PATENTS GRANTED IN CANADA, JANUARY 28 to FEBRUARY 3, 1874.

4,327.—H. Folliott, Temperanceville, York county, Ont., and J. W. Folliott, Bolsover, Victoria county, Ont., Extension of No. 278, on "Folliott's Self-Adjusting Roller." Jan. 28, 1875.

4,328.—J. Lewis, Manchester, Lancashire county, Eng. Improvements on water meters, and which improvements are also applicable to water motors, called "Lewis' Water Meter and Water Motor." Jan. 29, 1875.

4,329.—Wm. I. Doremus, New York city, U. S. Improvements on oscillating spring chairs, called "Doremus' Oscillating Spring Chair." Jan. 29, 1875.

4,330.—I. Kinney, London, Middlesex county, Ont. Improvements on lock and key guards, called "Kinney's Lock and Key Guard." Jan. 29, 1875.

4,331.—G. Boivin, Montreal. Improvements in cutting material for boot or shoe stiffeners, called "Renfort Boivin." Jan. 29, 1875.

4,332.—L. Kimball, Jr., Bolton, Vt., U. S. Improvements in the form of trays for chopping meat and other substances, called "Kimball's Chopping Tray." Jan. 29, 1875.

4,333.—LeRoy Satterlee, Rochester, Monroe county, N. Y., U. S.—Improvements on heating apparatus, called "Satterlee's Improved Heating Apparatus." Jan. 30, 1875.

4,334.—C. B. Sheldon, New York city, N. Y., U. S. Improvements on furniture casters, called "Sheldon's Perfected Caster." Jan. 30, 1875.

4,335.—H. P. Garland and A. J. Gove, San Francisco, San Francisco county, Cal., U. S. Improvements on sewing machines for sewing sacks or bags, carpets, etc. called "Garland and Gove's Bag-Sewing Machine." Jan. 30, 1875.

4,336.—F. Proudfoot, Toronto city, Ont. Improvements on drum heaters, called "Proudfoot's Radiating Drum Heater." Jan. 30, 1875.

4,337.—G. B. Tinker, Beebe Plain, Stanstead county, P. Q. Assignee, E. N. Bacon, Chelsea, Orange county, Vt., U. S. Improvements on ox-bow fasteners and guards, called "Bacon's Ox-Bow Fastener and Guard." Feb. 1, 1875.

4,338.—D. C. Morency, Lévis, P. Q. Une machine pour fournir un courant d'air continu, dit "Machine Soupplante de Morency." A machine to provide a constant current of air. Feb. 1, 1875.

4,339.—G. McEwan and C. O. Gibson, Rock Island, Stanstead county, P. Q. Assignee, G. Bachelder, of same place. Improvements on milk pans, called "McEwan and Gibson's Milk Pan." Feb. 1, 1875.

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4,340.—C. Schaal, Brooklyn, N. Y., U. S., and C. Baner, New York city, N. Y., U. S. Improvements on ice-breaking boats, called "Schaal's Improved Ice-Breaking Boat." Feb. 1, 1875.

4,341.—I. C. Williams, Richmond, Henrico county, Va. Improvements on processes of preparing plug tobacco, called "Williams' Process of Preparing Plug Chewing Tobacco." Feb. 2, 1875.

4,342.—C. B. Sheldon, New York city, N. Y., U. S. Improvements on packages for butter, called "Sheldon's Improved Metallic Butter Package." Feb. 2, 1875.

4,343.—I. C. Williams, Richmond, Henrico county, Va. Improvements on Plug Tobacco, called "Williams' Universal Tobacco." Feb. 2, 1875.

4,344.—E. E. Fitz, St. John, N. B. Improvements on method of mounting and operating globes, called "Fitz's Method of Mounting and Operating Globes." Feb. 2, 1875.

4,345.—W. I. Doremus, New York city, N. Y., U. S. Improvements on oscillating spring chair, called "Doremus' Oscillating Spring Chair." Feb. 2, 1875.

4,346.—E. F. Lane, Swanzey, Cheshire county, N. H., U. S. Improvements on game apparatus, called "Lane's Lightning Dart Wheel Game." Feb. 2, 1875.

4,347.—W. S. Shipe, Minerva, Stark County, O., U. S. Improvements on plane guides, called "Shipe's Plane Guide." Feb. 2, 1875.

4,348.—W. H. Farris, Cairo, Alexander county, Ill., U. S. Improvements in water circulating and steam generating side or basket grate bars, fire fronts, and rear arch bars; and the combination therewith, and with circulating grate bars not having side or basket bars, of pipes and valves for applying the same; applicable to locomotive, river, and other horizontal or box boilers, called "Farris' Improved Water Circulation and Steam Generating Grate." Feb. 2, 1875.

4,349.—C. Levey and Wm. Myles, Toronto city, Ont. Method of locking and unlocking nuts, called "Levey and Myles' Improvements in Locking and Unlocking Nuts and Washers." Feb. 2, 1875.

4,350.—P. Williams, Toronto city, Ont. Improvements on a machine for cleaning fruits, called "Williams' Champion Fruit Dresser." Feb. 2, 1875.

4,351.—S. M. Hibbard, Geneva Lake, Walworth county, Wis., U. S. Improvements on feather dusters, called "Hibbard's Improved Feather Dusters." Feb. 2, 1875.

4,352.—J. Haggert, Brampton, Peel county, Ont., and D. Brown, Township Garofroxa, Wellington county, Ont. Improvements on the grain separator of threshing machines, called "Haggert's Patent Dustless and Grain Saving Separator." Feb. 2, 1875

4,353.—W. A. Arnold, Montague, Muskegon county, Mich., U. S. Improvements on combined ironing tables and clothes racks, called "Arnold's Ironing Table and Clothes Rack." Feb. 3, 1875.

4,354.—D. F. Van Liew, Aurora, Kane county, Ill., U. S. Improvements on grain doors for freight cars, called "Van Liew's Grain Door for Freight Cars." Feb. 3, 1875.

355.—R. D. Guilford, St. Charles, Saginaw county, Mich., U. S. Improvements on raftsman's boot calks, called "Guilford's Boot Calks." Feb. 3, 1875.

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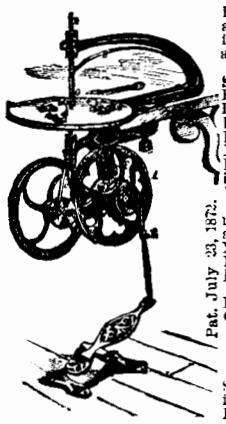

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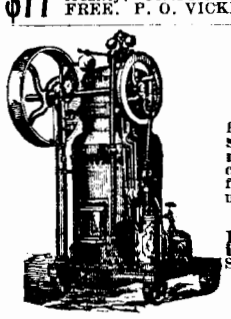

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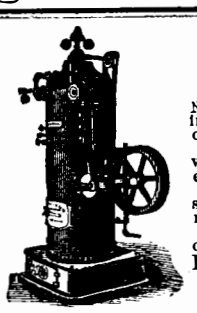

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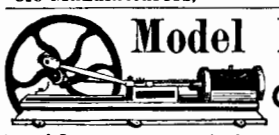

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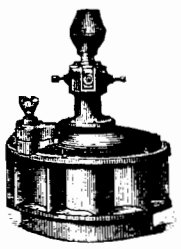

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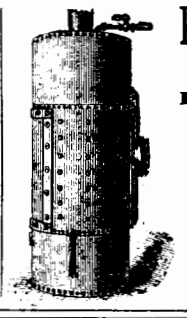

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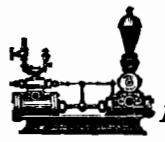

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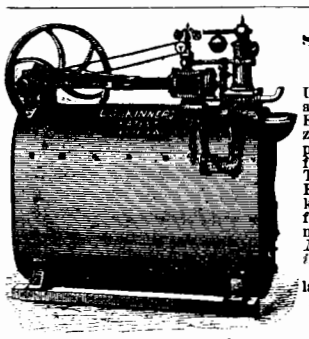

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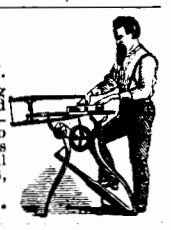

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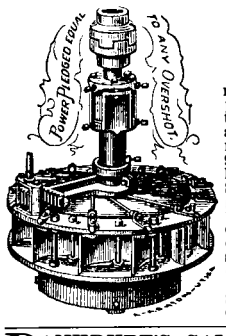

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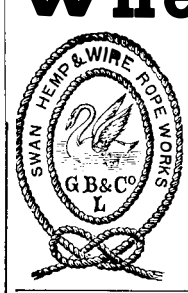

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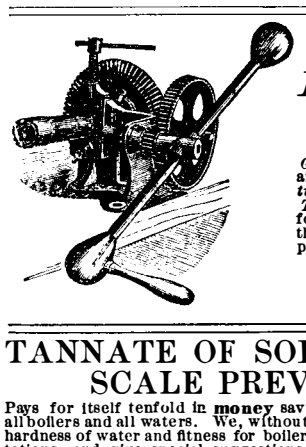

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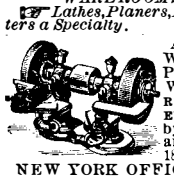

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